FORM L-85-59 (REV. 4-65)

222

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DOUGLAS

MISSILE & SPACE SYSTEMS DIVISION
DOUGLAS AIRCRAFT CO., INC.

ENGINEERING LABORATORIES & SERVICES
TECHNICAL MEMORANDUM

CATALOG NO. PDL 58752

TO: J. P. Loef, A-270 (Reproducible copy)

FROM: T. J. Sereno, A-270; ext. 2461

SUBJECT: 2-PDT 28-VDC GENERAL PURPOSE RELAY VIBRATION AND SHOCK TESTS

COPIES TO: N. Mincks, A3-KABC; H. B. Mitchell, A3-VCL; M. D. Smith, R. C. Mauldin, A3-263; T. J. Sereno (2), A-270; I. M. Williamson, A-270; P. Sellers, A2-263; J. Hilman, A3-KADO

REPORT NO. TM-DSV4B-ENV-R4952-1

DATE 11-19-65

REQUESTED BY R. C. Mauldin

E.W.O. 27808 TCD 1T06947

TEST PLAN & ITEM NO. AP 10 thru AP12 41412

SALES ORDER 5769-6304

CLASSIFICATION OR RESTRICTION: UNCLASSIFIED

INTRODUCTION

Vibration and shock tests were performed as part of the qualification testing of the 2-PDT 28-VDC general purpose relay. Twenty relays were tested, one group of 10 being subjected to sinusoidal vibration and another group of 10 being subjected to shock pulses. The tests were conducted at the vibration and shock facilities of the Douglas Dynamics Laboratory, Santa Monica, California, from January 30 through March 4, 1965.

PURPOSE

The purpose of the tests was to determine the ability of the test specimens to withstand the vibration and shock environments to be encountered in flight.

The purposes of this technical memorandum are to describe and document the vibration and shock portions of the tests and to transmit the vibration and shock data obtained from the tests.

FACILITY FORM 602
N70-75943 (ACCESSION NUMBER)
(THRU)
76 (PAGES)
None (CODE)
CR-113250 (NASA CR OR TMX OR AD NUMBER)
(CATEGORY)

SEP 1970
RECEIVED
NASA STI FACILITY
INPUT BRANCH

EQUIPMENT

Test Specimen

The twenty test specimens are described as follows:

Description	2PDT 28 VDC General Purpose Relay
Part Number	1A67747-1
Manufacturer	Babcock Company, Costa Mesa, California
Line Item Number	AP10 and AP12 (AP11 not scheduled for vibration and shock testing)
Serial No. (Vibration Tests)	26, 27, 28, 31, 33, 34, 35, 38, 39, 43
Serial No. (Shock Tests)	1, 2, 5, 6, 7, 9, 10, 11, 12, 13

Test Equipment

ITEM	MANUFACTURER	MODEL
Oscillograph	CEC	5-124
Galvanometers (4)	CEC	7-326 (3) 7-315 (1)
Accelerometers (5)	Endevco	2242C (3) 2215 (2)
Dynamonitor	Endevco	2705
Charge Amplifiers (3)	Endevco	2711
Memoscope	Hughes	104D
Cathode Follower	Douglas	---
Power Supply	Douglas	---
Camera	Polaroid	100
Temperature Conditioning and Measuring Unit	Autocontrol Labs.	2943
Hyge Shock Tester (NGC Lab.)	Hyge	HY6401
Vibration System	MB/Ling	C-70

Channel assignments and instrumentation information are presented on pages A1 through A3.

PROCEDURE

Vibration Testing

Three crystal accelerometers were used during sinusoidal vibration testing. One accelerometer was mounted along the axis of excitation, near the relay support points, and was used simultaneously for data recording and shaker control. The other two accelerometers were used to monitor and record the vibration levels along the two axes which were orthogonal to the excitation axis. Test setups and axes designations are shown on pages A1, B1, and B2.

The test specimens were subjected to sinusoidal vibration in each of 3 mutually perpendicular axes from 5 to 2000 to 5 cps with the frequency changing at the rate of 3.5 minutes per octave. The specified vibration levels were as follows:

FREQUENCY (cps)	LEVEL
5 - 35	0.4 inch D.A. Disp.
35 - 2000	25g (0 - peak)

The test fixture was designed to accommodate as many as 5 test specimens at one time, and the 10 test specimens were tested in groups of 4, 3, and 3. The test sequence was as follows:

DATE	SERIAL NO.	AXIS	TEMPERATURE	REMARKS
1/30/65	35, 38, 39, 43	Z	Ambient	No chatter
2/1/65	35, 38, 39, 43	Y	Ambient	Chatter on S/N 43
2/5/65	35, 38, 39, 43	X	Ambient	No chatter
2/6/65	27, 28, 29	X	+257°F	No chatter
2/6/65	27, 28, 29	Y	+257°F	No chatter
2/8/65	27, 28, 29	Z	+257°F	Broken lead on S/N 29
2/10/65	31, 33, 34	Z	-85°F	No chatter
2/11/65	31, 33, 34	X	-85°F	Momentary chatter on S/N 33 and 34
*2/12/65	31, 33, 34	X	-85°F	No chatter
2/13/65	31, 33, 34	Y	-85°F	No chatter
**2/13/65	43 only	Y	Ambient	No chatter

* Repeated test to investigate chatter on test of 2/11/65

** Repeated test of 2/1/65 which had chatter indication

PROCEDURE (continued)

The high temperature was obtained electrically through the temperature conditioning and measuring unit, which emitted heated air into a chamber box that enclosed the test specimens. The low temperature was provided by CO_2.

Functional requirements were monitored by the prime laboratory (AGB2) during sinusoidal vibration testing.

Shock Testing

Prior to performing shock tests, system accuracy was checked as follows:

1. Horizontal scale accuracy was verified by the Calibration and Certification sticker on the memoscope.

2. Vertical input accuracy was checked by inserting a known calibration signal and adjusting the memoscope potentiometer until the trace peaks coincided with the desired vertical scale divisions.

One crystal accelerometer was used to measure the shock accelerations to which the test specimens were subjected. The accelerometer was mounted on the test fixture near the relay mounting points, as shown on page B4. The shock force was provided by the Hyge shock tester and associated equipment as shown on page B5.

The test specimens were subjected to a total of 24 shock impacts; 4 in a forward and 4 in a reverse direction in each of the 3 mutually perpendicular axes shown on page A1. The specified shock levels were as follows:

Shape . . . . . Half Sine Wave

Acceleration . . . . . 50g (0 - peak)

Duration . . . . . 11 ±1 milliseconds

The test fixture was designed to accommodate as many as 5 test specimens at one time, and the 10 test specimens were tested in groups varying from 1 to 5.

The test specimens were tested in the following sequence:

DATE	SERIAL NO.	AXIS	SHOCK NO.	REMARKS
2/27/65	1, 2, 5, 6, 7	X_1	1 - 4	No chatter
2/27/65	1, 2, 5, 6, 7	X_2	5 - 8	No chatter
2/27/65	1, 2, 5, 6, 7	Y_1	9 - 12	No chatter
2/27/65	1, 2, 5, 6, 7	Y_2	13 - 16	No chatter
3/1/65	1, 2, 5, 6, 7	Z_2	17 - 20	No chatter

PROCEDURE (continued)

DATE	SERIAL NO.	AXIS	SHOCK NO.	REMARKS
3/1/65	1, 2, 5, 6	Z_1	21 - 24	No chatter
3/1/65	7, 9	Z_1	25 - 28	No chatter
3/1/65	9	Z_2	29 - 32	No chatter
3/1/65	10, 11, 12, 13	Z_2	33 - 34	No chatter
3/1/65	9, 10, 11, 12, 13	Y_2	35 - 38	S/N 9 chatter, shocks 35 & 36
3/2/65	9, 10, 11, 12, 13	Y_1	39 - 42	No chatter
3/2/65	9, 10, 11, 12, 13	X_1	43 - 46	No chatter
3/2/65	9, 10, 11, 12, 13	X_2	47 - 50	No chatter
3/4/65	10, 11, 12, 13	Z_2	51 - 52	No chatter
3/4/65	10, 11, 12, 13	Z_1	53 - 56	No chatter

Shock testing was performed at ambient temperature. Functional requirements were monitored by the prime laboratory (AGB2) during shock testing.

The shock waveforms were displayed on a memoscope and photographed by a Polaroid camera.

RESULTS AND DISCUSSION

Vibration Testing

During the sinusoidal vibration tests at ambient temperature, with the shaker in the vertical position as shown on page B2, excessive crosstalk developed at some frequencies in both minor axes. Surveys were conducted on the fixtures to determine how the crosstalk could be eliminated. It was discovered that by using only one part of the 2 part fixture as shown on pages B1 and B2, the crosstalk was minimized in the X and Y axes. Vibration in the Z axis was accomplished by using the originally designed fixture configuration and the slip table as shown on page B3. With this setup, a maximum of four relays were vibrated at one time.

During the downsweep in the X axis at -85°F, chatter was indicated on relays 33 and 34 at 1218 cps. Short sweeps were run back and forth between 2000 and 1000 cps in an effort to reproduce the chatter indication. On the fifth run of this

RESULTS AND DISCUSSION (continued)

series, the input acceleration was increased to 30g (0 - peak). The sixth run was made from 300 to 2000 to 300 cps, and again chatter was indicated at 1075 cps at 10g (0 - peak). A dwell was made between these two frequencies at 1085 cps for a few minutes. The next chatter was at 947 cps, indicating that relays 33 and 34 were chattering at progressively lower frequencies. The X axis vibration test at -85°F was repeated on February 12, 1965, with no chatter.

Sinusoidal inputs were continuously recorded, monitored, and verified by the oscillograph, so no control data were analyzed. Crosstalk was recorded in terms of amplitude (acceleration) of the accelerometers oriented in the two minor axes. Plots of crosstalk in g (0-peak) versus frequency (cps) are presented on pages A4 through A25.

Shock Testing

Representative shock photographs, each depicting the shock pulse in one direction in each axis, are presented on pages A26 and A27. All shocks were approximately 50g (0 - peak) for 11 milliseconds duration.

Inspection

Visual examination of the test specimens revealed that a broken lead on relay 29 after sinusoidal testing in the Z axis was the only physical damage resulting from vibration and shock testing.

ORIGINATOR J. L. Heinzelman

T. J. Sereno, Section Chief
Acoustics and Dynamics
Environmental Laboratories

ATTACHMENTS

Pages A1 through A27

Pages B1 through B5

FORM NO. 28-598 (2-68)

DOUGLAS

INSTRUMENTATION CHANNEL ASSIGNMENT DYNAMIC TEST

DSV4B

AZ

TEST TITLE GENERAL PURPOSE RELAYS

S/O 5769-6304 EWO 27808 TCD IT06947

P/N SPECIMEN 1A67747-1

ENGINEER J.L.H EXT 2466

TECHNS. PAUL WEST

STANDARD ACCEL. TYPE _____ S/N _____ CAL. DUE 'Y'
BABCOCK CO.

TAPE REC. MODEL _____ S/N _____ FACILITY C-70 UNIT 143

RECORD SPEED _____ IN/SEC _____ TAPE REEL NO. _____

OSCILLOGRAPH TYPE 5-124 S/N 6195

PAPER SPEED _____ MM/IN SEC

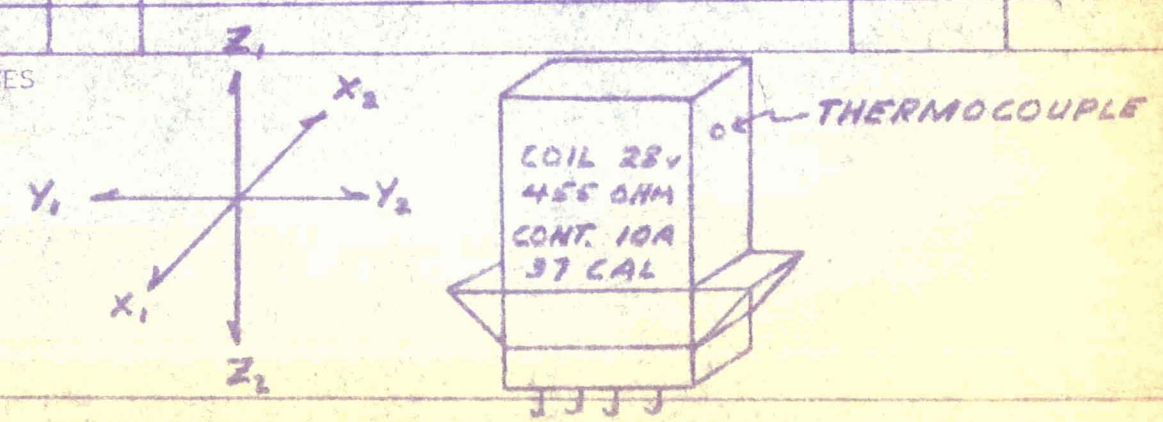
TIMING LINES _____ SEC PAPER _____

REPORT NO. R4952-1
PAGE A1

SHEET 1 OF 3
DATE _____
LINE ITEM AP10-12
RUN NO. _____
AXIS 'Z'

LOC. NO.	TAPE REC. CHAN	OSC CHAN	XDCR CABLE NO.	MEASUREMENT LOCATION	RESP. AXIS	XDCR MODEL	SERIAL NO.	XDCR AMP MODEL	SERIAL NO.	OSC GALVO MODEL	SERIAL NO.	TAPE REC AMP MODEL	SERIAL NO.	CALIB LEVEL g's	CALIB INSERT MVR		LOC. NO.
1		1		FREQUENCY MARKER						7-315	806CF						1
2		4	C	SERVO CONTROL } AMBIENT	Z	2242C	FA85	2705		7-326	7233			30	177		2
3		6	1	CROSSTALK } TESTS	X	2216	R265B	2705		7-326	13611			5	22.0		3
4		8	2	CROSSTALK	Y	2242C	FA49	2705		7-326	13659			5	36.2		4
5																	5
6																	6
7		4	C	SERVO CONTROL } 257°F	Z	2242C	FA85	2705		7-326	7233			30	177		7
8		6	1	CROSSTALK } TESTS	Y	2242C	FA49	2705		7-326	13611			5	36.2		8
9		8	2	CROSSTALK	X	2242C	KA35	2705		7-326	13659			5	40.0		9
0																	0
1																	1
2		4	C	SERVO CONTROL } -85°F	Z	2242C	FA85	2711		7-326	7233			30	179		2
3		6	1	CROSSTALK } TESTS	Y	2242C	FA49	2711		7-326	13611			10	2.12		3
4		8	2	CROSSTALK	X	2242C	KA35	2711		7-326	13659			10	2.2		4
5																	5
6																	6
7				SHOCK TESTS (NGC LAB)	Z	2215	AH78										7
8																	8
9																	9
0																	0

NOTES & SKETCHES



FORM NO. 28-598 (7-65)

DOUGLAS

INSTRUMENTATION CHANNEL ASSIGNMENT DYNAMIC TEST

DSV 4B

TEST TITLE GENERAL PURPOSE RELAYS

S/O 5769-6304 EWO 27808 TCD IT06947

P/N SPECIMEN 1A67747-1

ENGINEER J.L.H EXT 2466

TECHNS. PAUL WEST

STANDARD ACCEL. TYPE ____ S/N ____ CAL DUE ____
BABCOCK CO.

TAPE REC. MODEL ____ S/N ____ FACILITY C-70 UNIT 143

RECORD SPEED 1 IN/SEC ____ TAPE REEL NO. ____

OSCILLOGRAPH TYPE S-129 S/N 6195

PAPER SPEED ____ MM/SEC

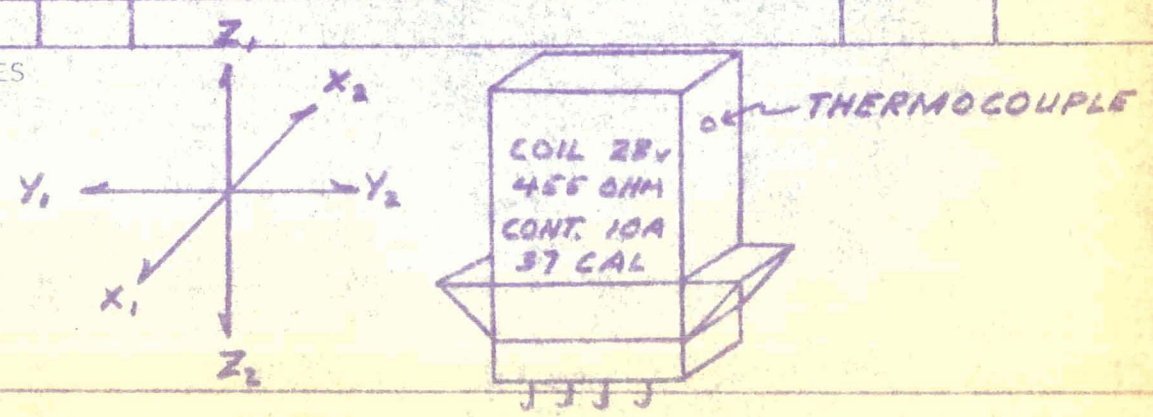
TIMING LINES ____ SEC PAPER ____

REPORT NO R4952-1
PAGE A2

SHEET 1 OF 3
DATE ____
LINE ITEM AP10-12
RUN NO. ____
AXIS 'Y'

LOC. NO.	TAPE REC. CHAN	OSC CHAN	XDCR CABLE NO.	MEASUREMENT LOCATION	RESP. AXIS	XDCR MODEL	SERIAL NO.	XDCR AMP MODEL	SERIAL NO.	OSC GALVO MODEL	SERIAL NO.	TAPE REC AMP MODEL	SERIAL NO.	CALIB LEVEL g's	CALIB INSERT MVR		LOC NO.
1		1		FREQUENCY MARKER						7-315	806CH						1
2		4	C	SERVO CONTROL } AMBIENT	Y	2242C	FA86	2705		7-326	7233			30	177		2
3		6	1	CROSSTALK } TESTS	X	2215	R2658	2705		7-326	13611			5	22.0		3
4		8	2	CROSSTALK	Z	2242C	FA49	2705		7-326	13659			5	36.2		4
5																	5
6																	6
7		4	C	SERVO CONTROL } 257°F	Y	2242C	FA86	2705		7-326	7233			30	177		7
8		6	1	CROSSTALK } TESTS	X	2242C	FA49	2705		7-326	13611			5	22.0		8
9		8	2	CROSSTALK	Z	2242C	KA35	2705		7-326	13659			5	40.0		9
0																	0
1																	1
2		4	C	SERVO CONTROL } -85°F	Y	2242C	FA86	2711		7-326	7233			30	179		2
3		6	1	CROSSTALK } TESTS	X	2242C	FA49	2711		7-326	13611			10	2.13		3
4		8	2	CROSSTALK	Z	2242C	KA35	2711		7-326	13659			10	2.2		4
5																	5
6																	6
7				SHOCK TESTS (NGC LAB)	Y	2215	AH38										7
8																	8
9																	9
0																	0

NOTES & SKETCHES



FORM NO. 28-598 (2-65)

DOUGLAS

INSTRUMENTATION CHANNEL ASSIGNMENT DYNAMIC TEST

DSV4B

REPORT NO R4952-1
PAGE A3

SHEET 1 OF 3
DATE
LINE ITEM AP10-12
RUN NO.
AXIS 'X'

TEST TITLE GENERAL PURPOSE RELAYS
S.O. 5769-6304 EWO 27808 TCD IT06947
P/N SPECIMEN 1A67747-1
ENGINEER J.L.H. EXT 2466
TECHNS. PAUL WEST
STANDARD ACCEL. TYPE _____ S/N _____ CAL DUE _____
BABCOCK CO.

TAPE REC. MODEL _____ S/N _____ FACILITY C-70 UNIT 143
RECORD SPEED _____ IN/SEC _____ TAPE REEL NO. _____
OSCILLOGRAPH TYPE 5-124 S/N 6195
PAPER SPEED _____ MM/IN SEC
TIMING LINES _____ SEC PAPER _____

LOC. NO.	TAPE REC. CHAN	OSC CHAN	XDCR CABLE NO.	MEASUREMENT LOCATION	RESP. AXIS	XDCR MODEL	SERIAL NO.	XDCR AMP MODEL	SERIAL NO.	OSC GALVO MODEL	SERIAL NO.	TAPE REC AMP MODEL	SERIAL NO.	CALIB LEVEL g's	CALIB INSERT MVR		LOC NO.
1		1		FREQUENCY MARKER						7-315	806CF						1
2		4	C	SERVO CONTROL } AMBIENT	X	2242C	FA86	2705		7-326	7233			30	177		2
3		6	1	CROSSTALK } TESTS	Y	2216	R265B	2705		7-326	13611			5	22.0		3
4		8	2	CROSSTALK	Z	2242C	FA49	2705		7-326	13659			5	36.2		4
5																	5
6																	6
7		4	C	SERVO CONTROL } 257°F	X	2242C	FA86	2705		7-326	7233			30	177		7
8		6	1	CROSSTALK } TESTS	Y	2242C	FA49	2705		7-326	13611			5	22.0		8
9		8	2	CROSSTALK	Z	2242C	KA35	2705		7-326	13659			5	40.0		9
0																	0
1																	1
2		4	C	SERVO CONTROL } -85°F	X	2242C	FA86	2711		7-326	7233			30	174		2
3		6	1	CROSSTALK } TESTS	Y	2242C	FA49	2711		7-326	13611			10	2.13		3
4		8	2	CROSSTALK	Z	2242C	KA35	2711		7-326	13659			10	2.2		4
5																	5
6																	6
7				SHOCK TESTS (NGC LAB)	X	2216	AH78										7
8																	8
9																	9
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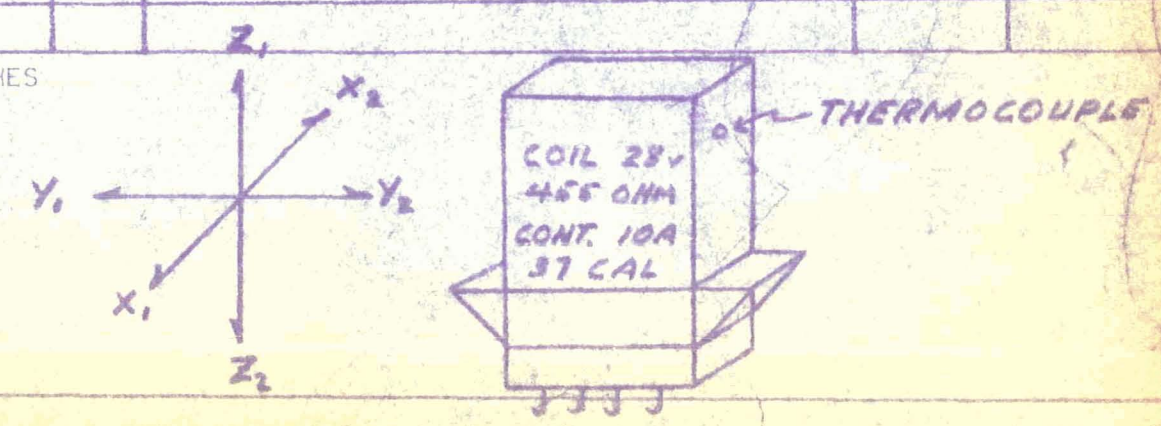
NOTES & SKETCHES



DOUGLAS AIRCRAFT COMPANY, INC.

5769-6304 27808 ITC6947

PAGE NO: A4

REPORT NO: ENV-R4962-1

SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP AMBIENT

CONFIGURATION: RELAYS# 35, 38, 39, & 43

NOTE: SEE PAGE 81, 82, 83 FOR PICK UP LOCATION.

☒ UPSWEEP ———— CROSSTALK

☐ DOWNSWEEP - - - - - -

TEST CONDITIONS:

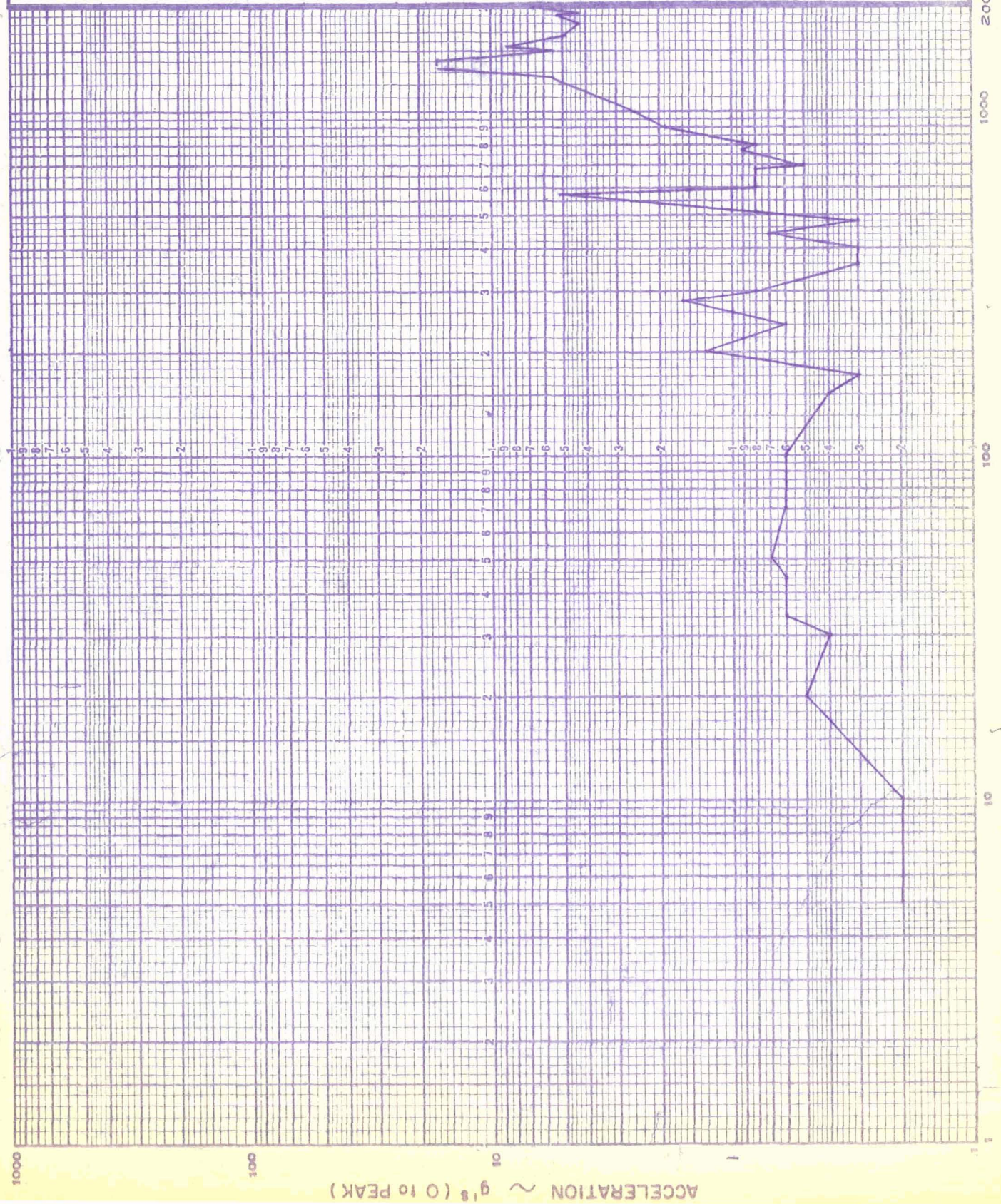
TEST DATE 1-30-65

AXIS OF EXCITATION Z

PICK UP NUMBER 1 EA49 2242C

PICK UP RESPONSE IN Y AXIS

INPUT ACCEL. PER PAGE



SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP AMBIENT

CONFIGURATION: RELAYS # 35, 38, 39, & 43

NOTE: SEE PAGE B1, B2 B3 FOR PICK UP LOCATION.

☒ UPSWEEP ———— CROSS TALK

☐ DOWNSWEEP - - - - - -

TEST CONDITIONS:

TEST DATE 1-30-65

AXIS OF EXCITATION Z

PICK UP NUMBER 2 2658 2215

PICK UP RESPONSE X AXIS

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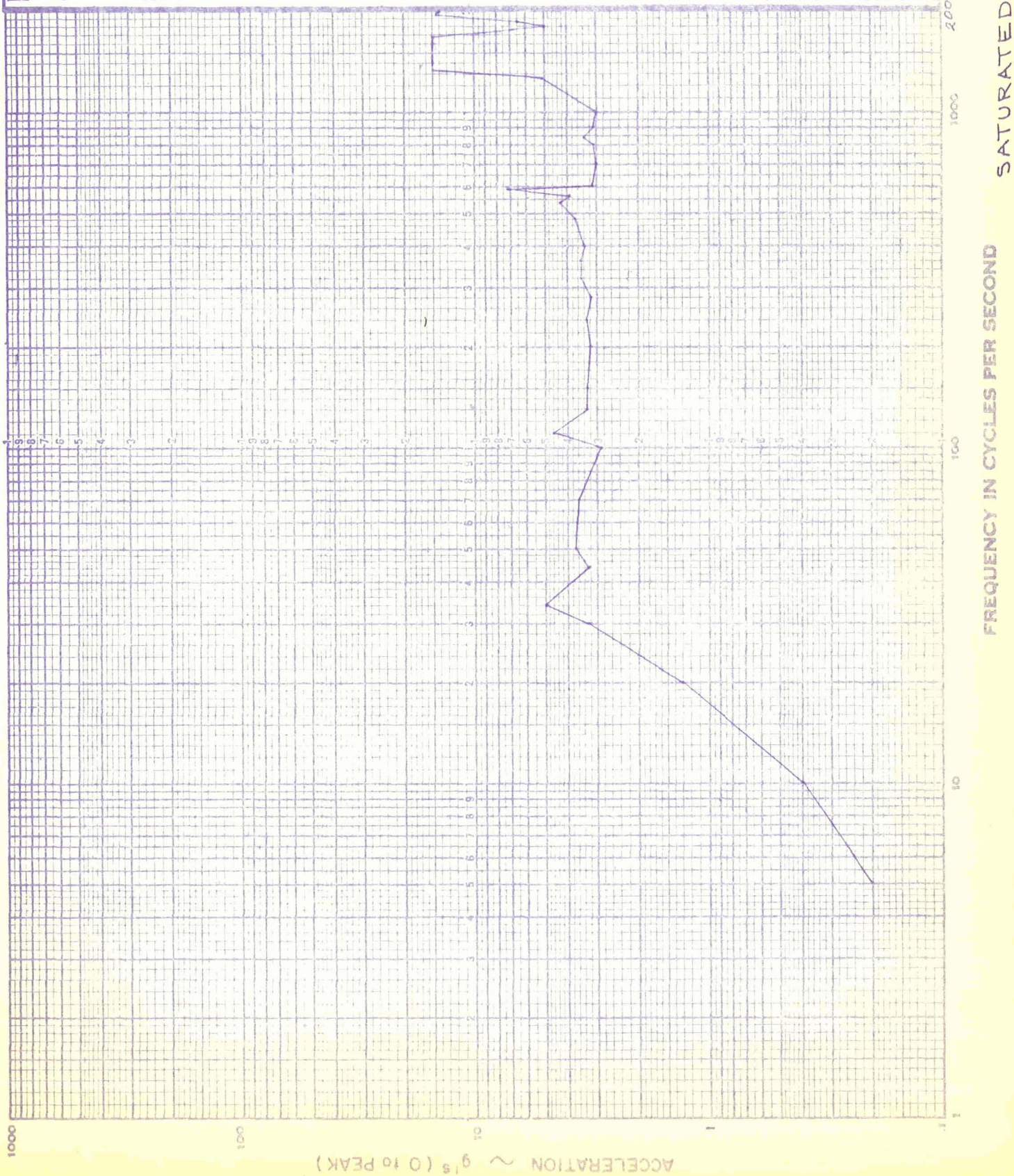


PAGE NO: A6
REPORT NO: DSV48-ENV-R4952-

DOUGLAS AIRCRAFT COMPANY, INC.

5769-6304 27808 1T06947

SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP AMBIENT

CONFIGURATION: RELAYS # 35, 38, 39, & 43

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☒ UPSWEEP ———— CROSSTALK

☒ RERUN - - - - - -

TEST CONDITIONS:

TEST DATE 2-1-65

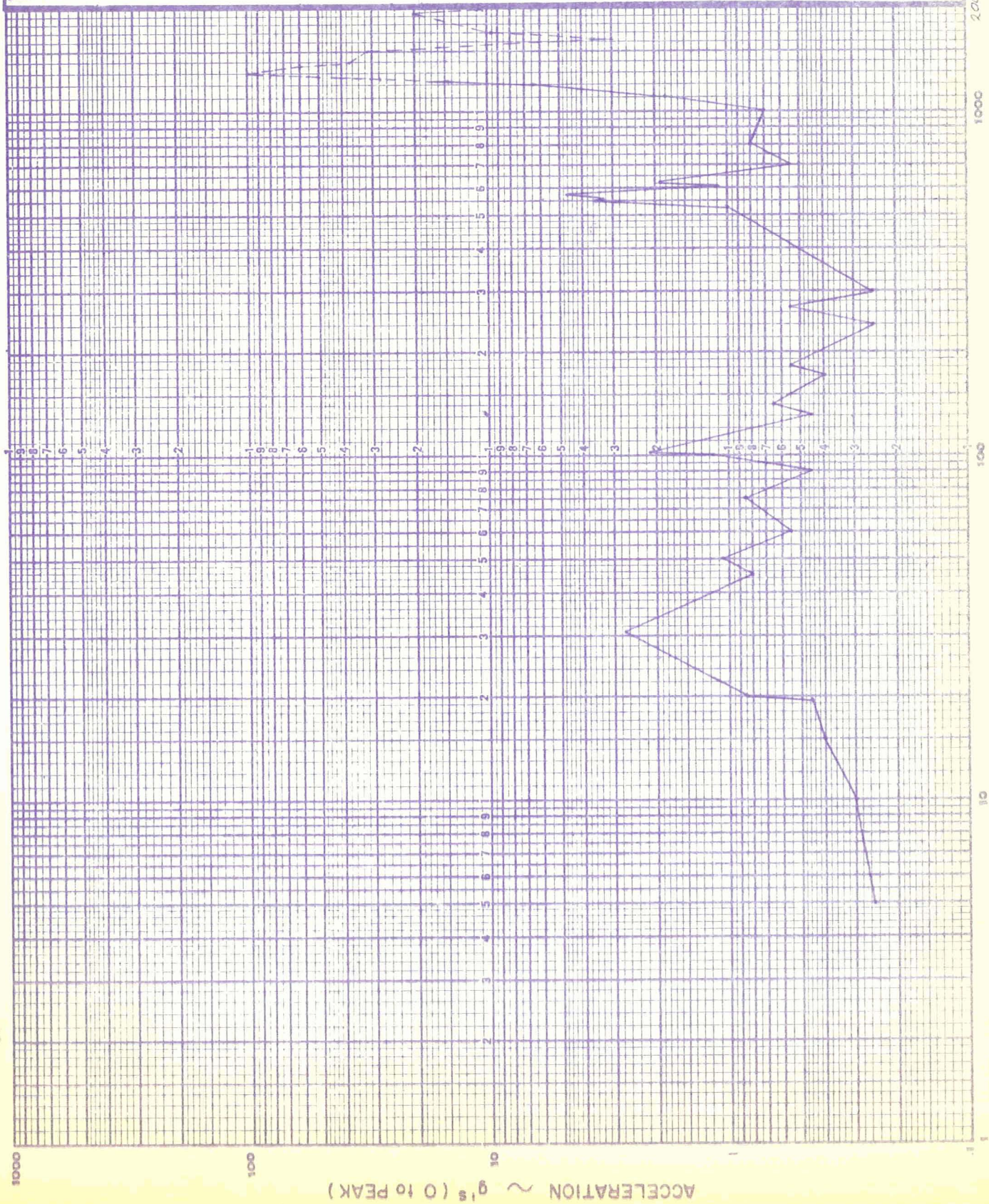
AXIS OF EXCITATION Y

PICK UP NUMBER 1 FA49 2242C

PICK UP RESPONSE IN Z AXIS

INPUT ACCEL. PER PAGE

SATURATED AT 1220 TO 1300 CPS



DOUGLAS AIRCRAFT COMPANY, INC.

5769-6304 27808 1T06947

SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP AMBIENT

CONFIGURATION: RELAYS # 35, 38, 39, & 43

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☒ UPSWEEP ——— CROSSTALK

☒ RERUN - - - - - -

TEST CONDITIONS:

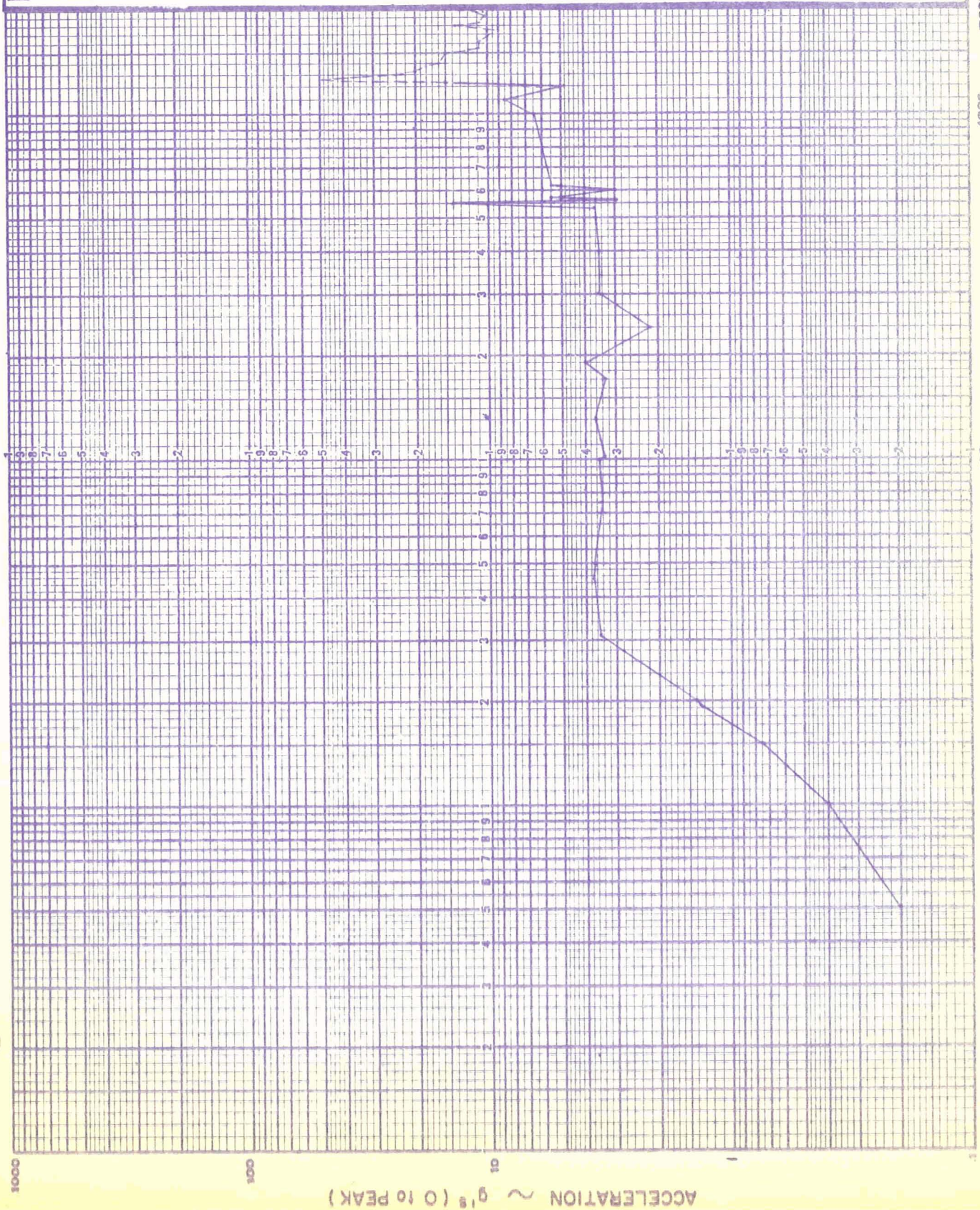
TEST DATE 2-1-65

AXIS OF EXCITATION Y

PICK UP NUMBER 2 2658 2215

PICK UP RESPONSE IN X AXIS

INPUT ACCEL. PER PAGE



5769-6304 27808 1T06947

SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP AMBIENT

CONFIGURATION: RELAYS # 35, 38, 39, & 43

NOTE: SEE PAGE ~~B1~~ B2, B3 FOR PICK UP LOCATION.

☒ UPSWEEP ———— CROSSTALK

☐ DOWNSWEEP - - - - - -

TEST CONDITIONS:

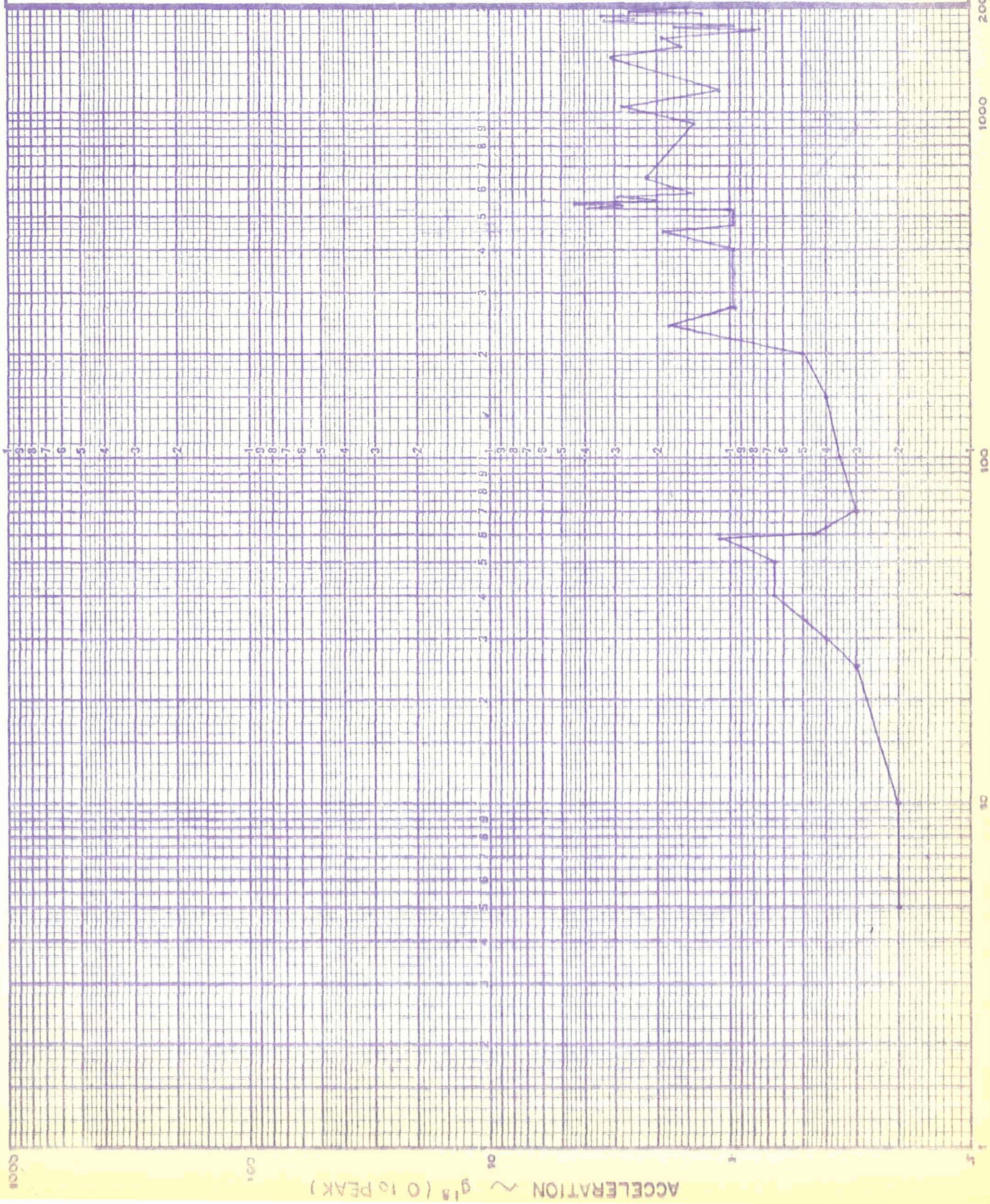
TEST DATE 2-5-65

AXIS OF EXCITATION X

PICK UP NUMBER 1 FA49 2242C

PICK UP RESPONSE IN Z AXIS

INPUT ACCEL. PER PAGE



5769-6304 27808 1T06947

SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP

AMBIENT

CONFIGURATION: RELAYS # 35, 38, 39, & 43

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☒ UPSWEEP ———— CROSSTALK

☐ DOWNSWEEP - - - - - -

TEST CONDITIONS:

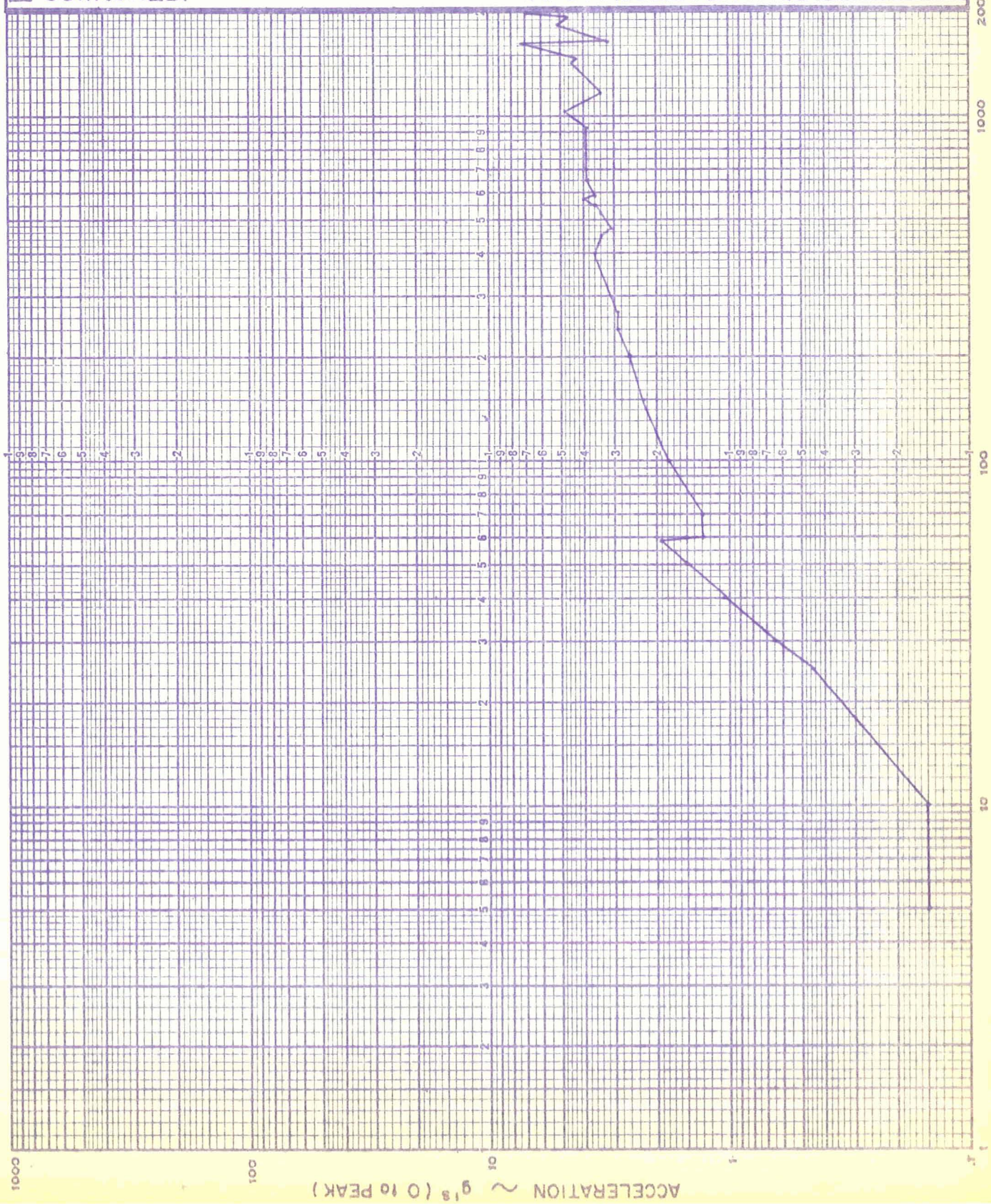
TEST DATE 2-5-65

AXIS OF EXCITATION X

PICK UP NUMBER 2 R2658 2215C

PICK UP RESPONSE IN Y AXIS

INPUT ACCEL. PER PAGE



SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP 257°F

CONFIGURATION: RELAYS #27, 28, 29

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☐ UPSWEEP

☒ DOWNSWEEP

CROSSTALK

TEST CONDITIONS:

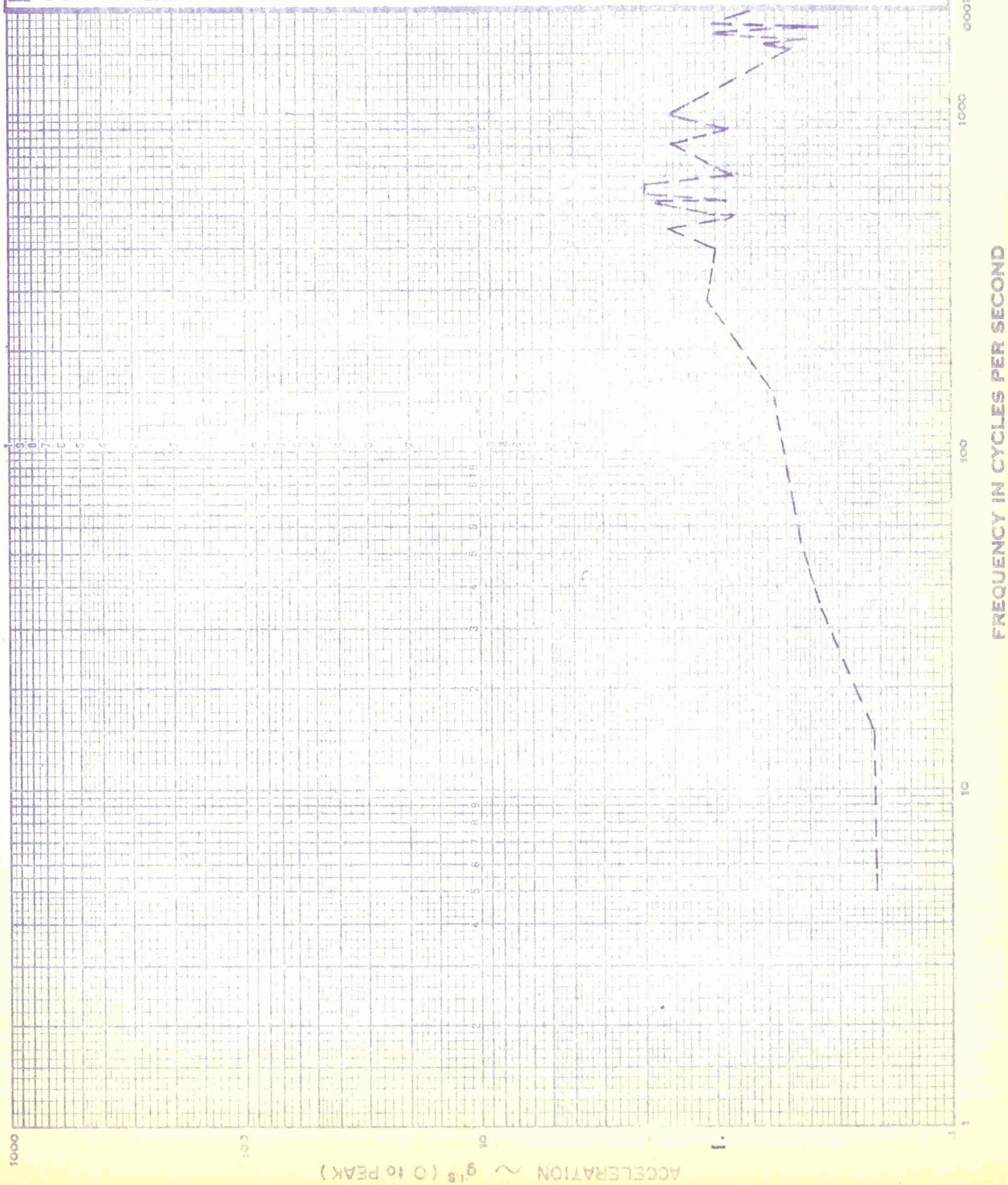
TEST DATE 2-6-65

AXIS OF EXCITATION X

PICK UP NUMBER 1-FA49 22420

PICK UP RESPONSE IN Y AXIS

INPUT ACCEL PER PAGE



5769-6304 27808 ITO-06947

SIV-B GENERAL PURPOSE RELAYS AP10-12
SINUSOIDAL FREQUENCY SWEEP 257°F

CONFIGURATION: RELAYS # 27, 28, 29

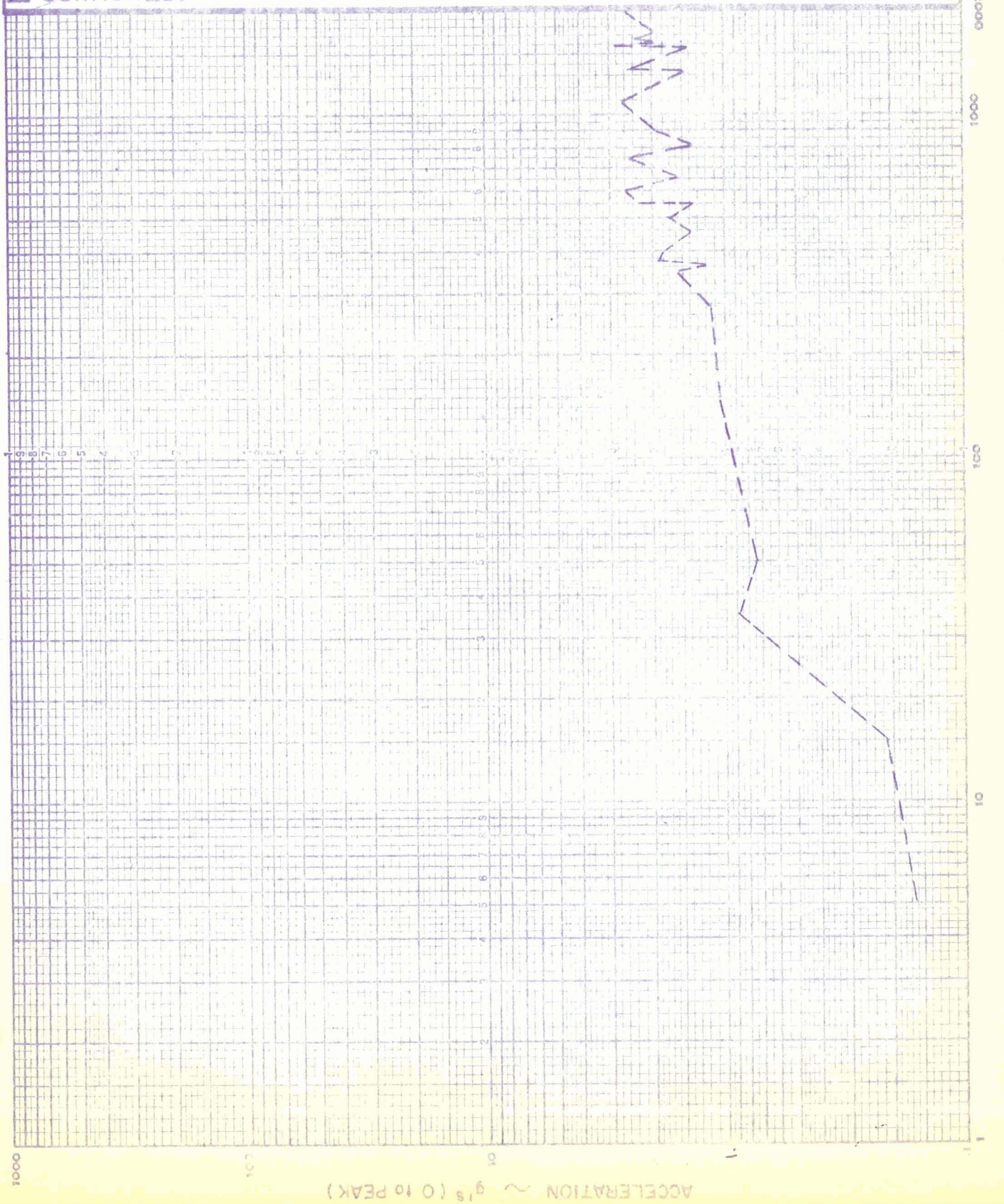
NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☐ UPSWEEP

☒ DOWNSWEEP

CROSSTALK

TEST CONDITIONS:
TEST DATE 2-6-65
AXIS OF EXCITATION X
PICK UP NUMBER 2-KA35 2242 C
PICK UP RESPONSE IN Z AXIS
INPUT ACCEL. PER PAGE



DOUGLAS AIRCRAFT COMPANY, INC.

5769-6304 27808 1T06947

SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP 257°F

CONFIGURATION: RELAY #27, 28, 29

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☐ UPSWEEP

☒ DOWNSWEEP

CROSSTALK

TEST CONDITIONS:

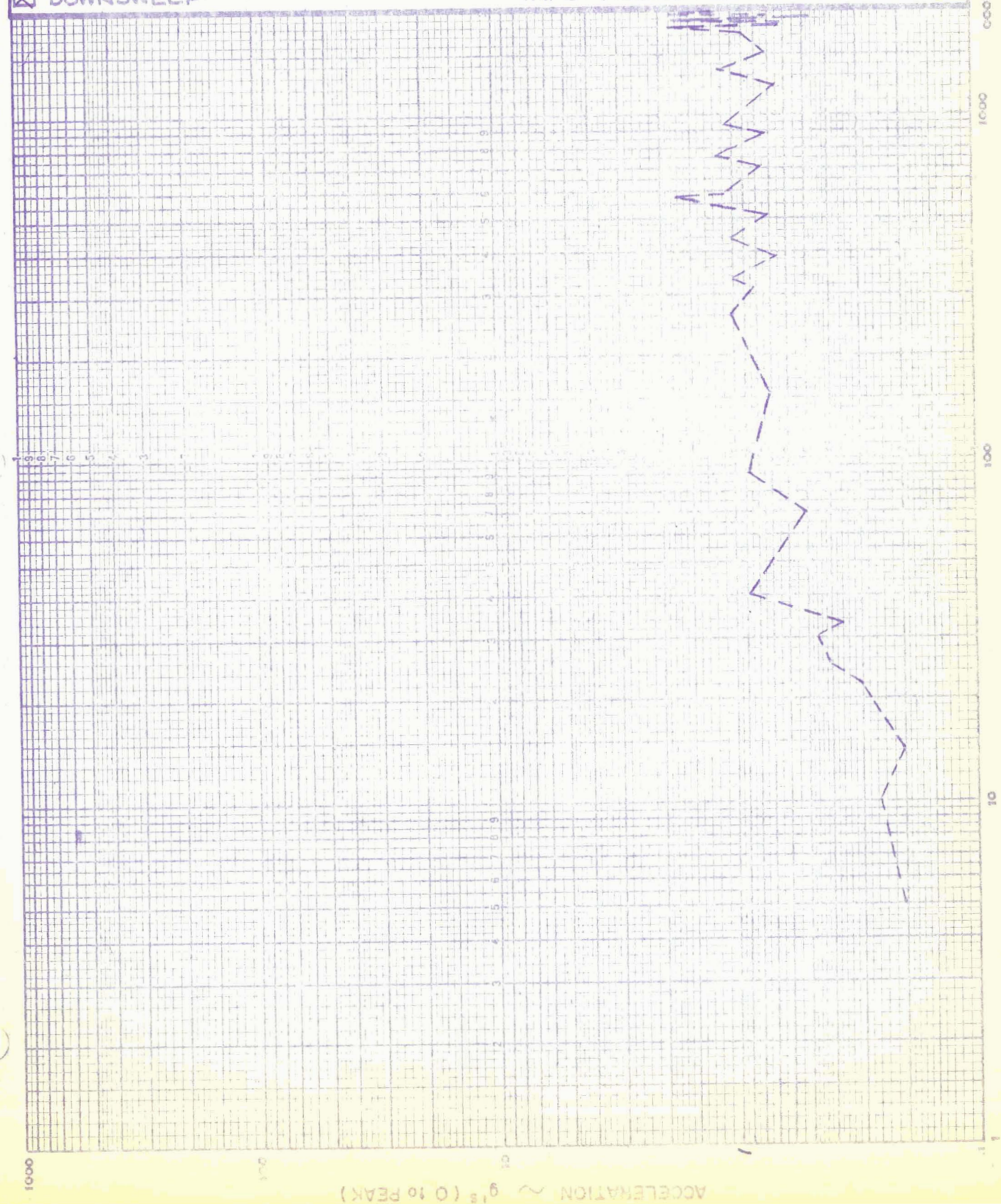
TEST DATE 2-6-65

AXIS OF EXCITATION Y

PICK UP NUMBER 1 FA49 2242C

PICK UP RESPONSE IN X AXIS

INPUT ACCEL. PER PAGE



SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP 257°F

CONFIGURATION: RELAY # 27, 28, 29

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☐ UPSWEEP

☒ DOWNSWEEP

CROSSTALK

TEST CONDITIONS:

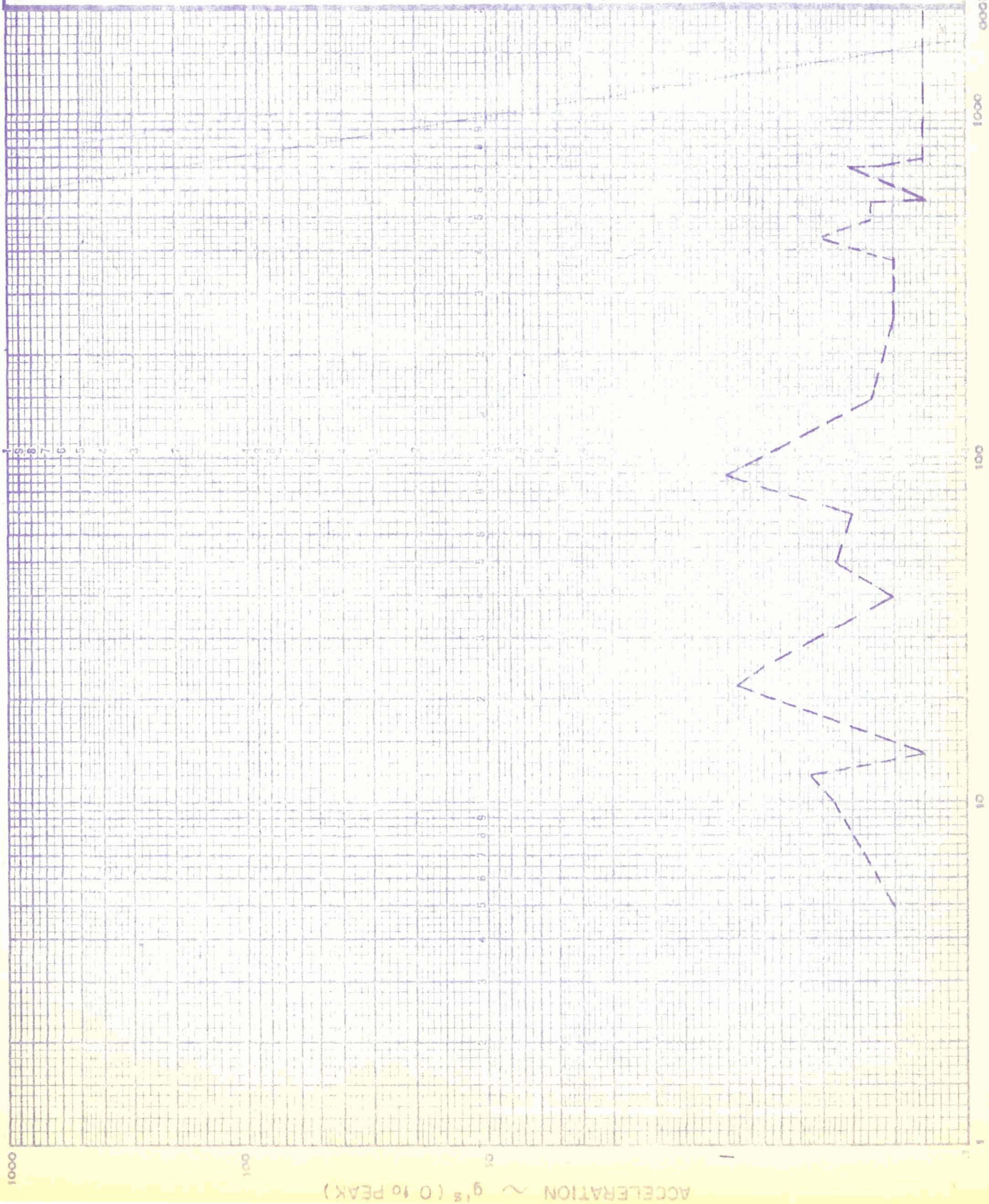
TEST DATE 2-6-65

AXIS OF EXCITATION Y

PICK UP NUMBER 2 KA35-22420

PICK UP RESPONSE IN Z AXIS

INPUT ACCEL PER PAGE



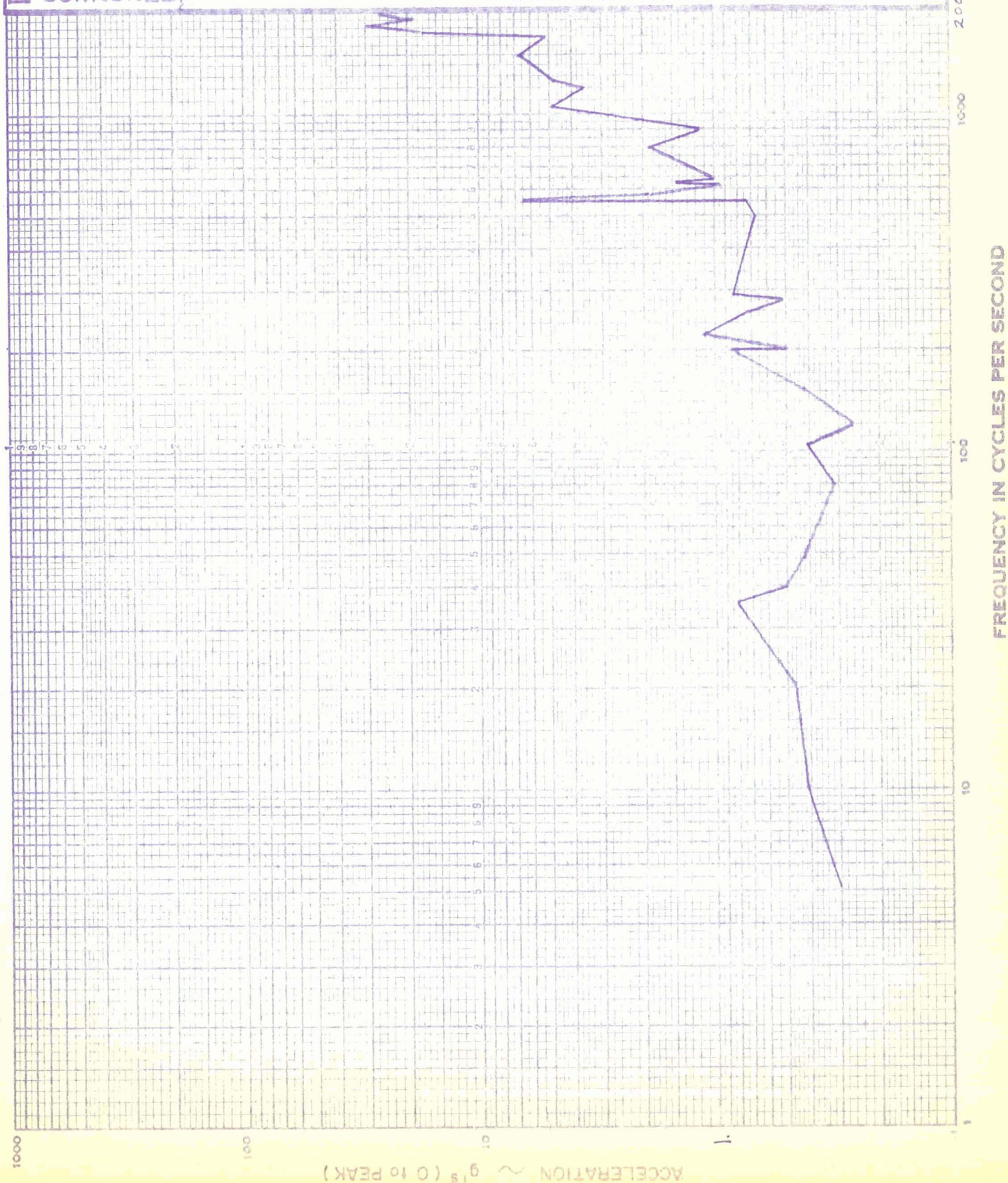
SIV-B GENERAL PURPOSE RELAYS AP10-12
SINUSOIDAL FREQUENCY SWEEP 257°F

CONFIGURATION: RELAYS #27, 28, 29

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☒ UPSWEEP ——— CROSSTALK
☐ DOWNSWEEP - - - - - -

TEST CONDITIONS:
TEST DATE 2-8-65
AXIS OF EXCITATION Z
PICK UP NUMBER 1-FA49 2705
PICK UP RESPONSE IN Y AXIS
INPUT ACCEL PER PAGE



5769-6304 27808 ITO-06947

SIV-B GENERAL PURPOSE RELAYS AP10-12
SINUSOIDAL FREQUENCY SWEEP 257°F

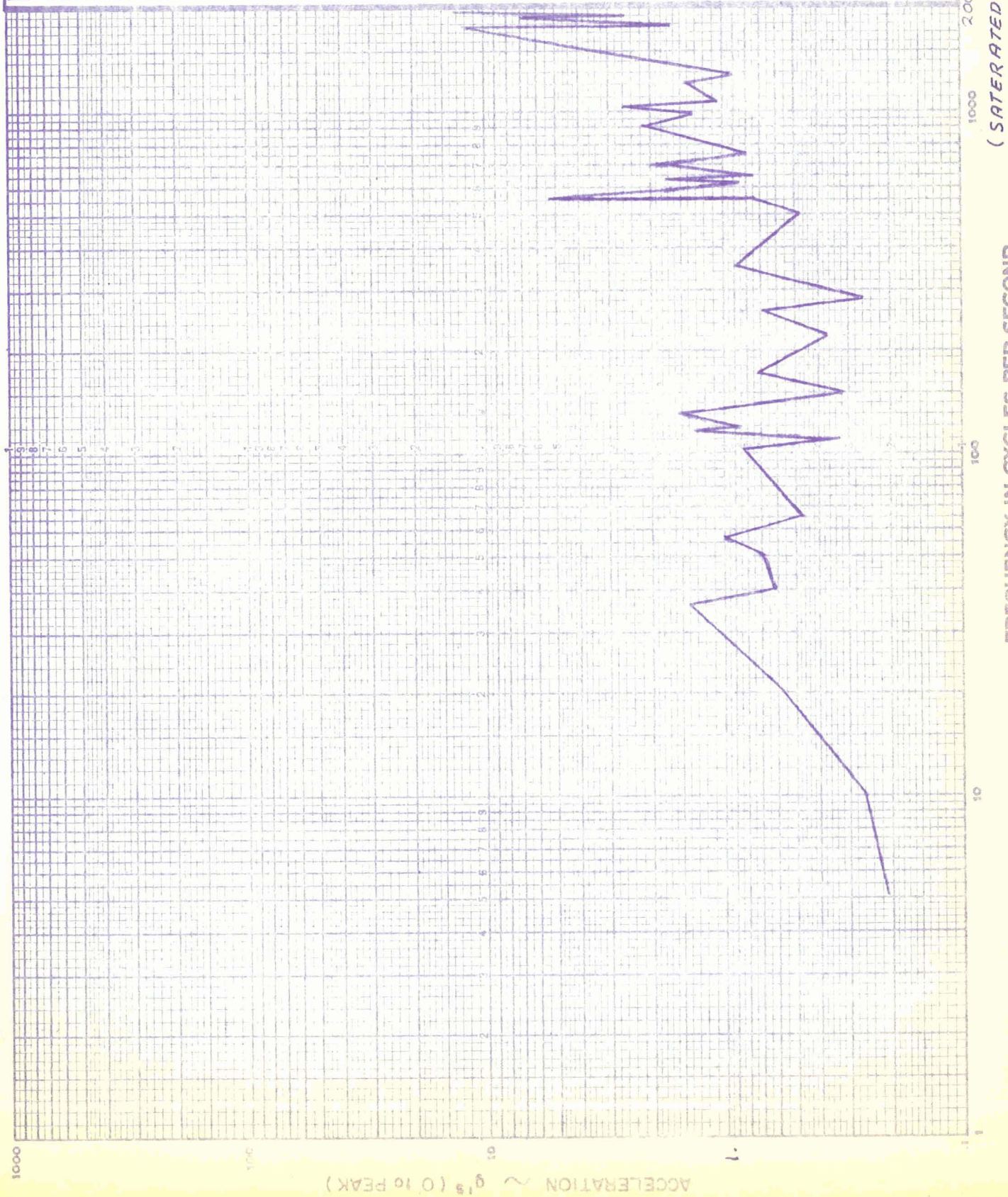
CONFIGURATION: RELAYS #27, 28, 29

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☒ UPSWEEP ——— CROSSTALK

☐ DOWNSWEEP - - - - -

TEST CONDITIONS:
TEST DATE 2-8-65
AXIS OF EXCITATION Z
PICK UP NUMBER 2-KA352242C
PICK UP RESPONSE IN X AXIS
INPUT ACCEL. PER PAGE



SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP -85°F

CONFIGURATION: RELAY #31, 33, 34

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☒ UPSWEEP ———— CROSSTALK

☐ DOWNSWEEP - - - - - -

TEST CONDITIONS:

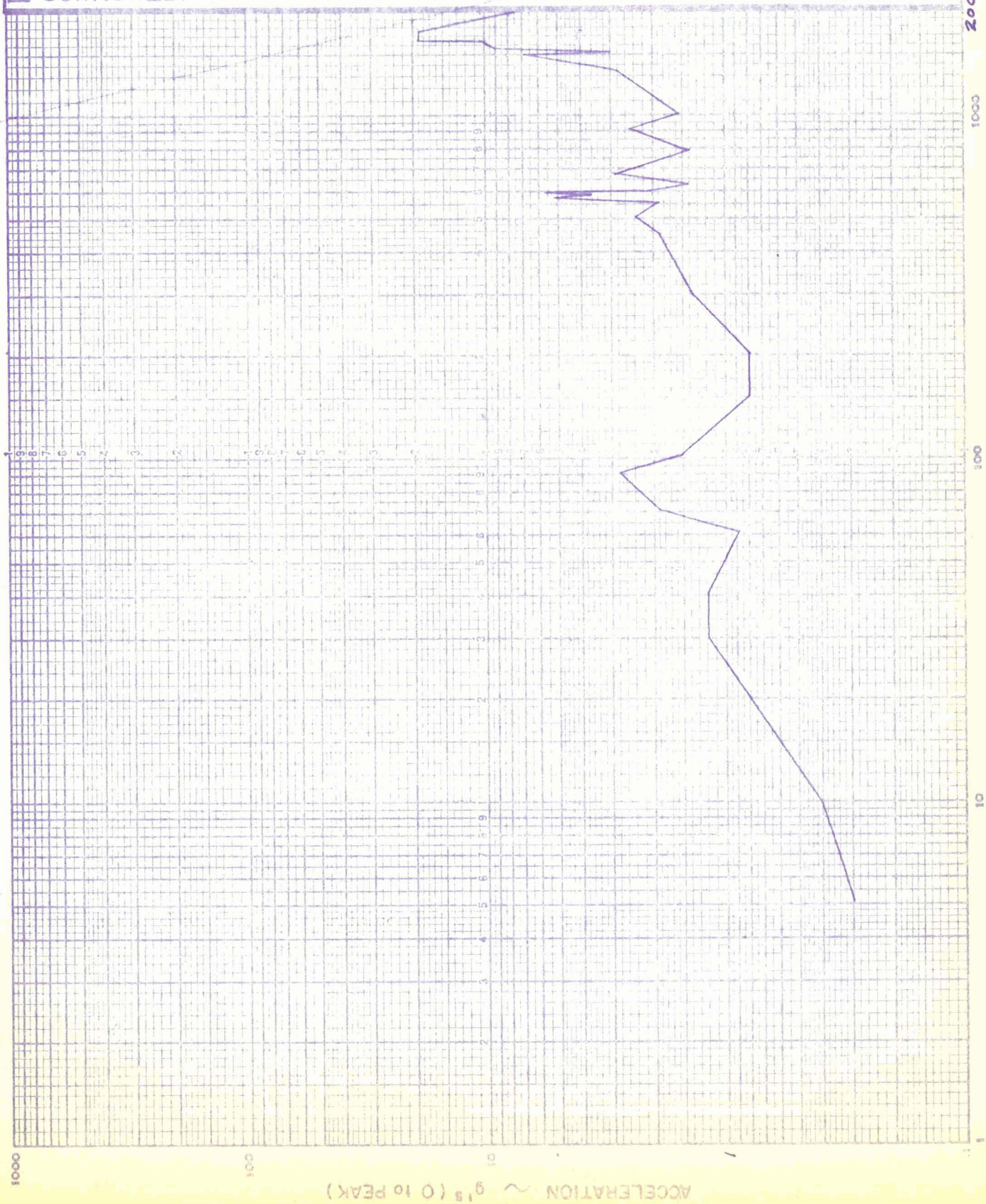
TEST DATE 2-10-65

AXIS OF EXCITATION Z

PICK UP NUMBER 1FA49 2242C

PICK UP RESPONSE IN Y AXIS

INPUT ACCEL. PER RANGE



23

SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP -85 °F

CONFIGURATION: RELAYS # 31, 33, 34

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☒ UPSWEEP ——— CROSSTALK

☐ DOWNSWEEP - - - - - -

TEST CONDITIONS:

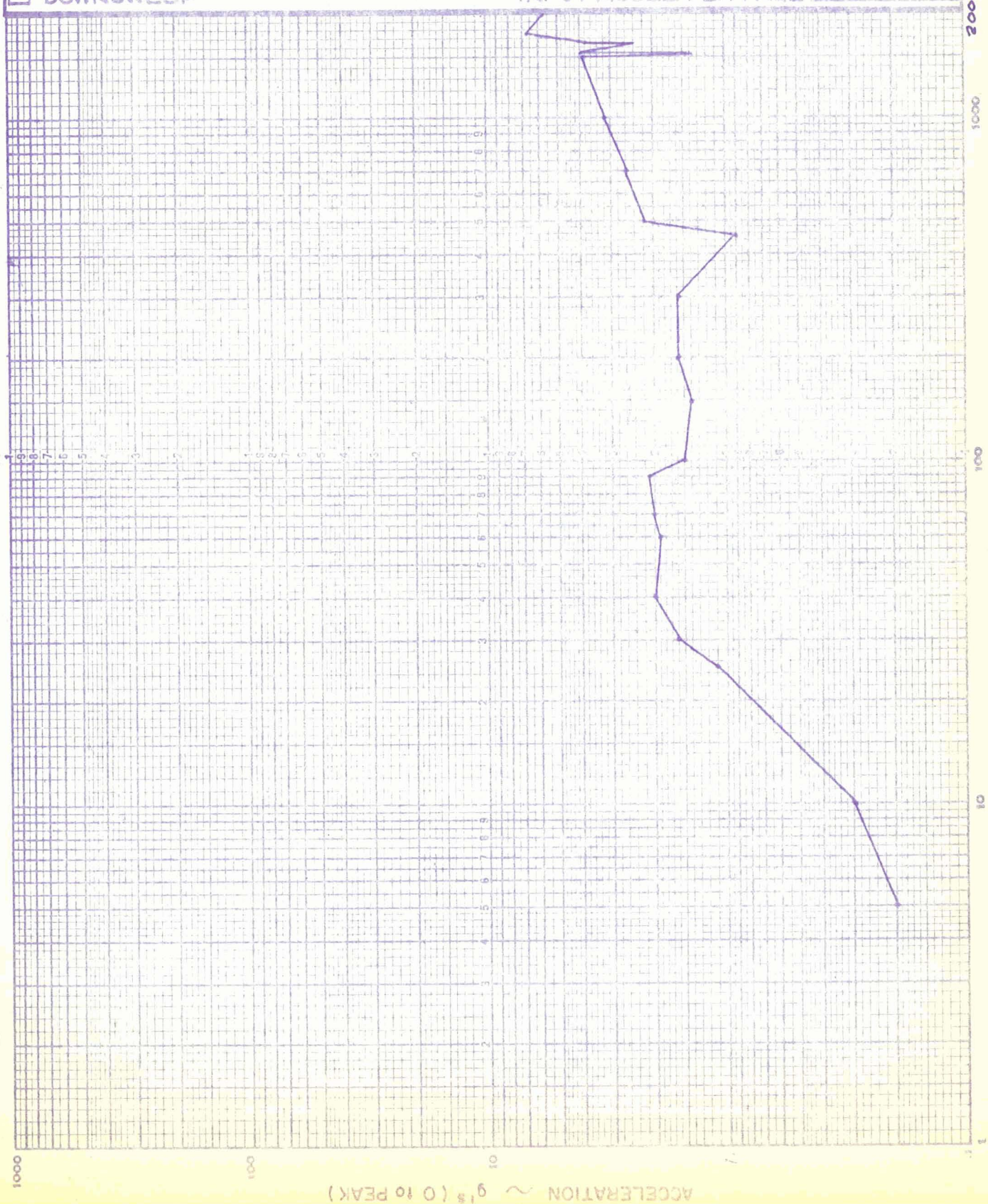
TEST DATE 2-10-65

AXIS OF EXCITATION Z

PICK UP NUMBER 2KA35 2242C

PICK UP RESPONSE IN X AXIS

INPUT ACCEL PER PAGE



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SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP -85°F

CONFIGURATION: RELAY #31, 33, 34

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☒ UPSWEEP ———— CROSSTALK

☐ DOWNSWEEP - - - - - -

TEST CONDITIONS:

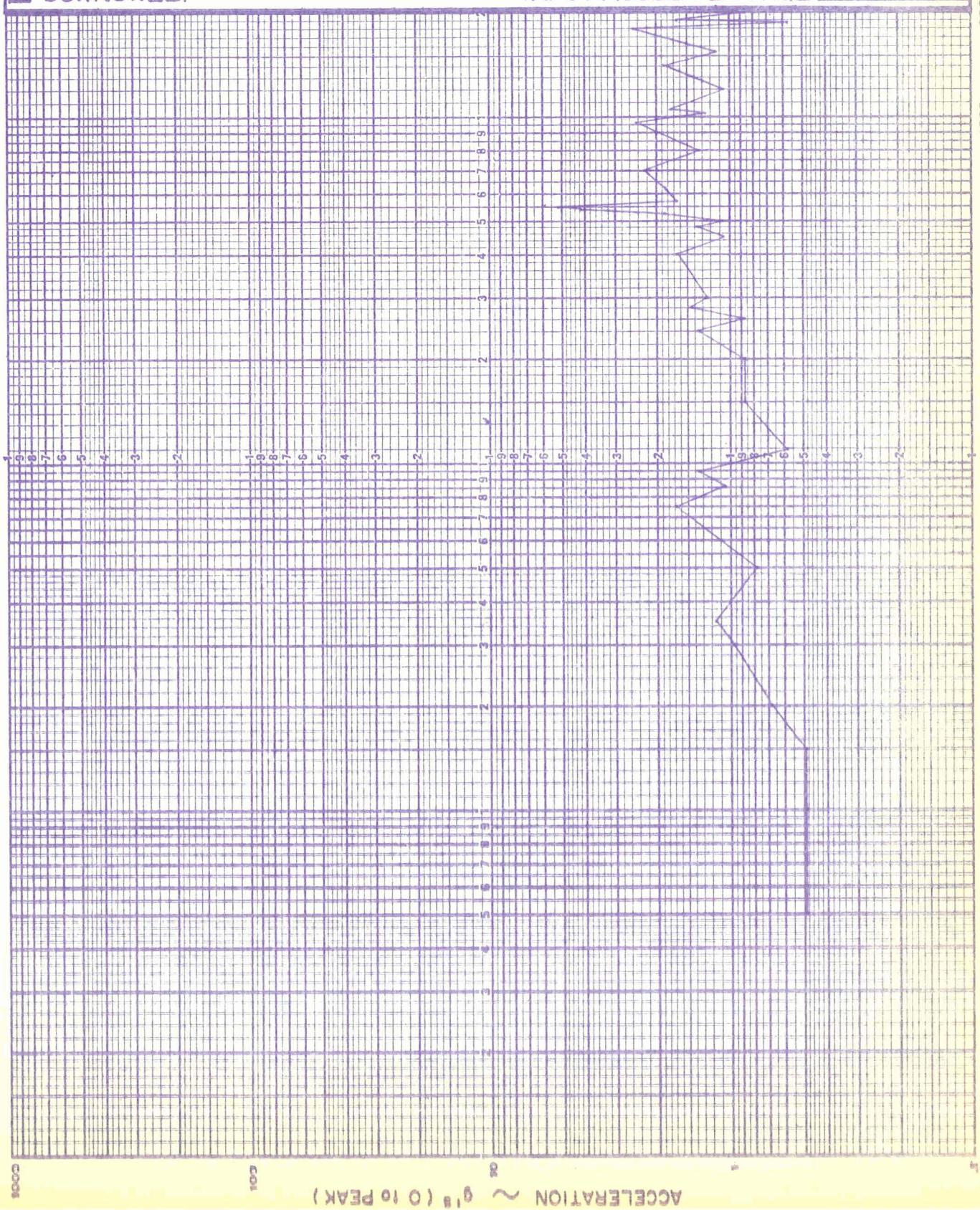
TEST DATE 2-11-65

AXIS OF EXCITATION X

PICK UP NUMBER 1 FA49 2243C

PICK UP RESPONSE IN Y AXIS

INPUT ACCEL. PER PAGE



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SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP -85° F

CONFIGURATION: RELAY # 31, 33, 34

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☒ UPSWEEP ——— CROSSTALK

☐ DOWNSWEEP - - - - - -

TEST CONDITIONS:

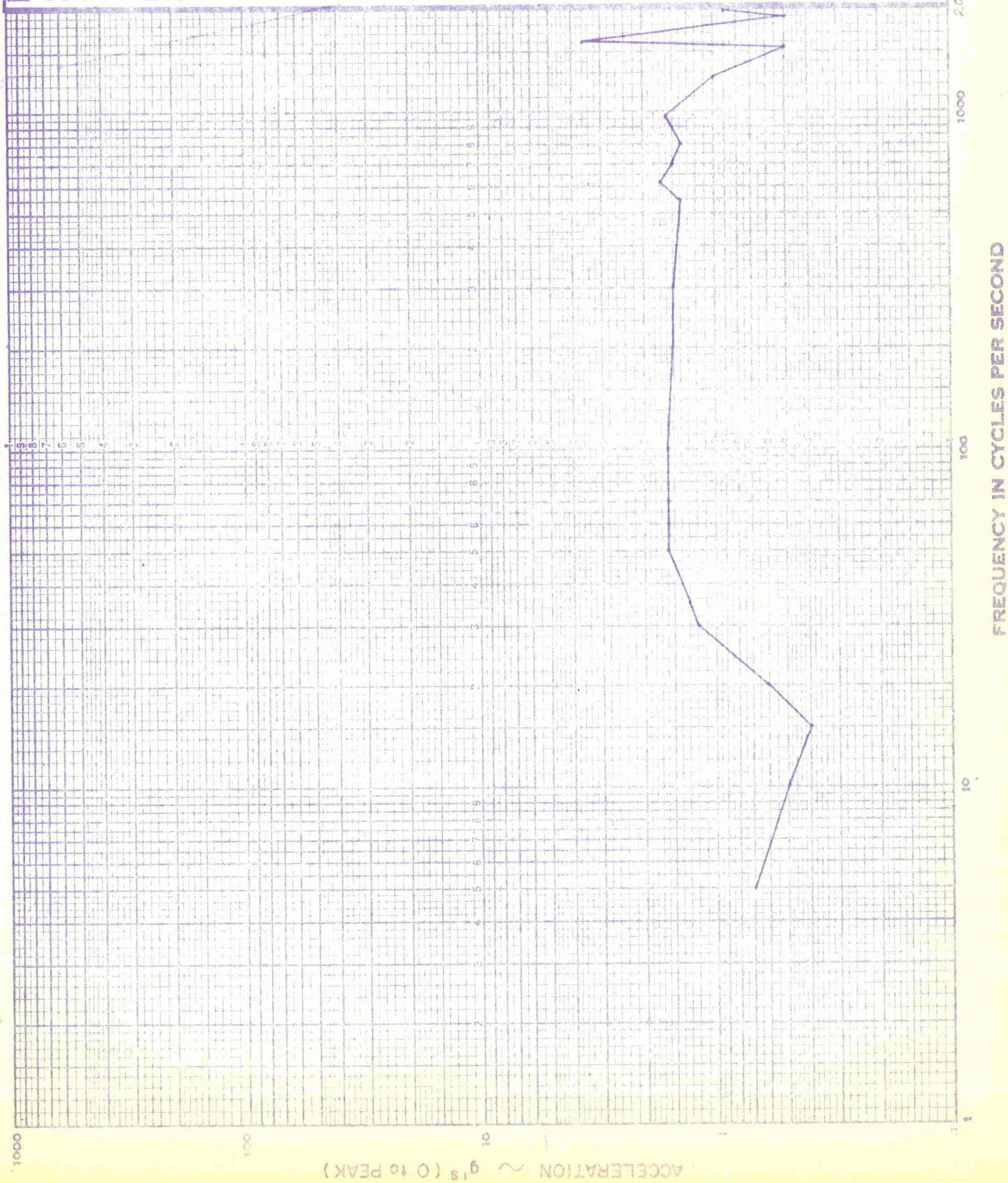
TEST DATE 2-11-65

AXIS OF EXCITATION X

PICK UP NUMBER 2 KA35 2242C

PICK UP RESPONSE IN Z AXIS

INPUT ACCEL PER PAGE



DOUGLAS AIRCRAFT COMPANY, INC.

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SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP -85°F

CONFIGURATION: RELAYS # 31, 33, 34

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☒ UPSWEEP

☐ DOWNSWEEP

CROSS TALK

TEST CONDITIONS:

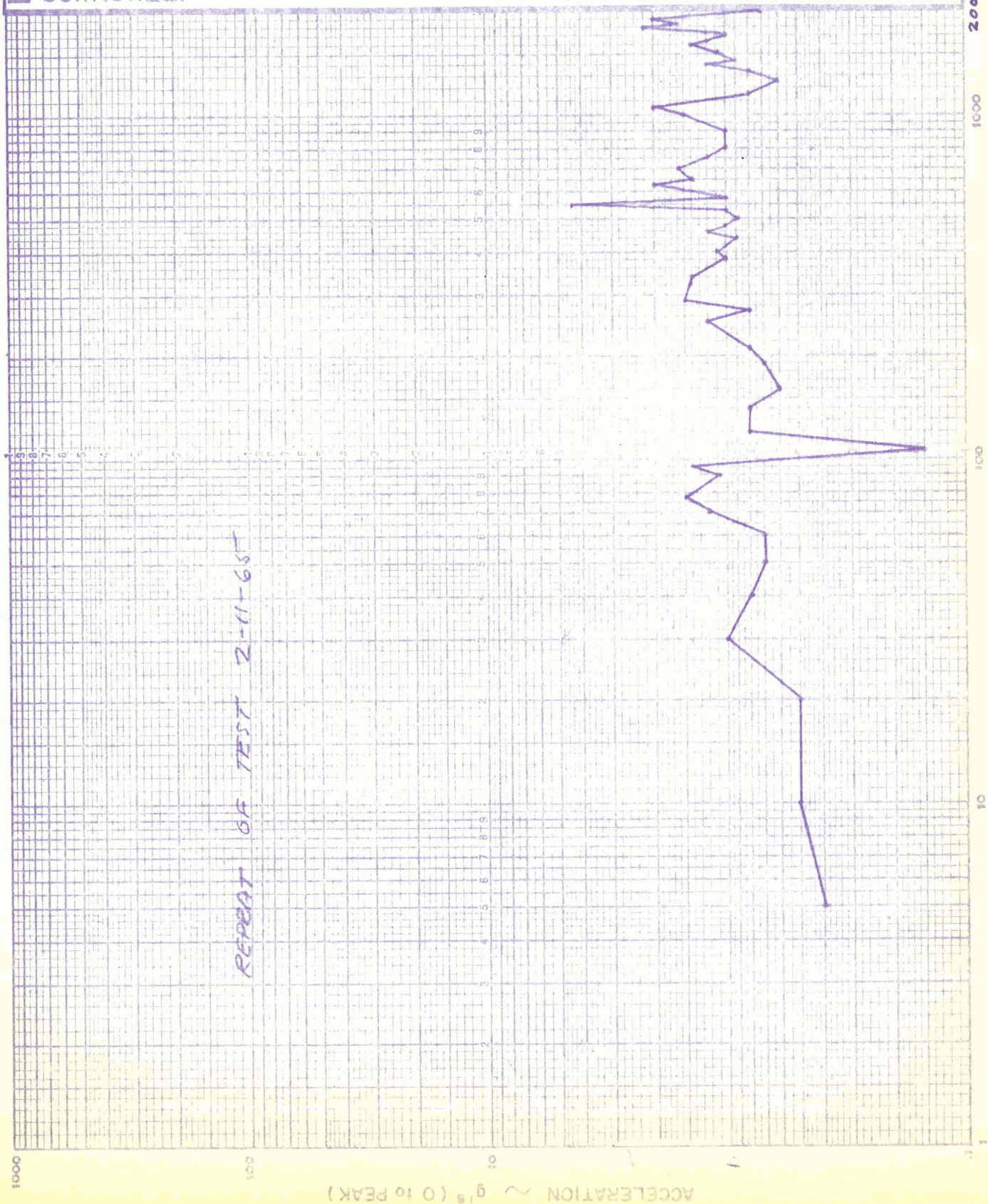
TEST DATE 2-12-65

AXIS OF EXCITATION X

PICK UP NUMBER 1FA49 2242C

PICK UP RESPONSE IN Y AXIS

INPUT ACCEL PER PAGE



DOUGLAS AIRCRAFT COMPANY, INC.

5769-6304 27808 IT06947

SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP -85°F

CONFIGURATION: RELAYS # 31, 33, 34

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☒ UPSWEEP ——— CROSSTALK

☐ DOWNSWEEP - - - - - -

TEST CONDITIONS:

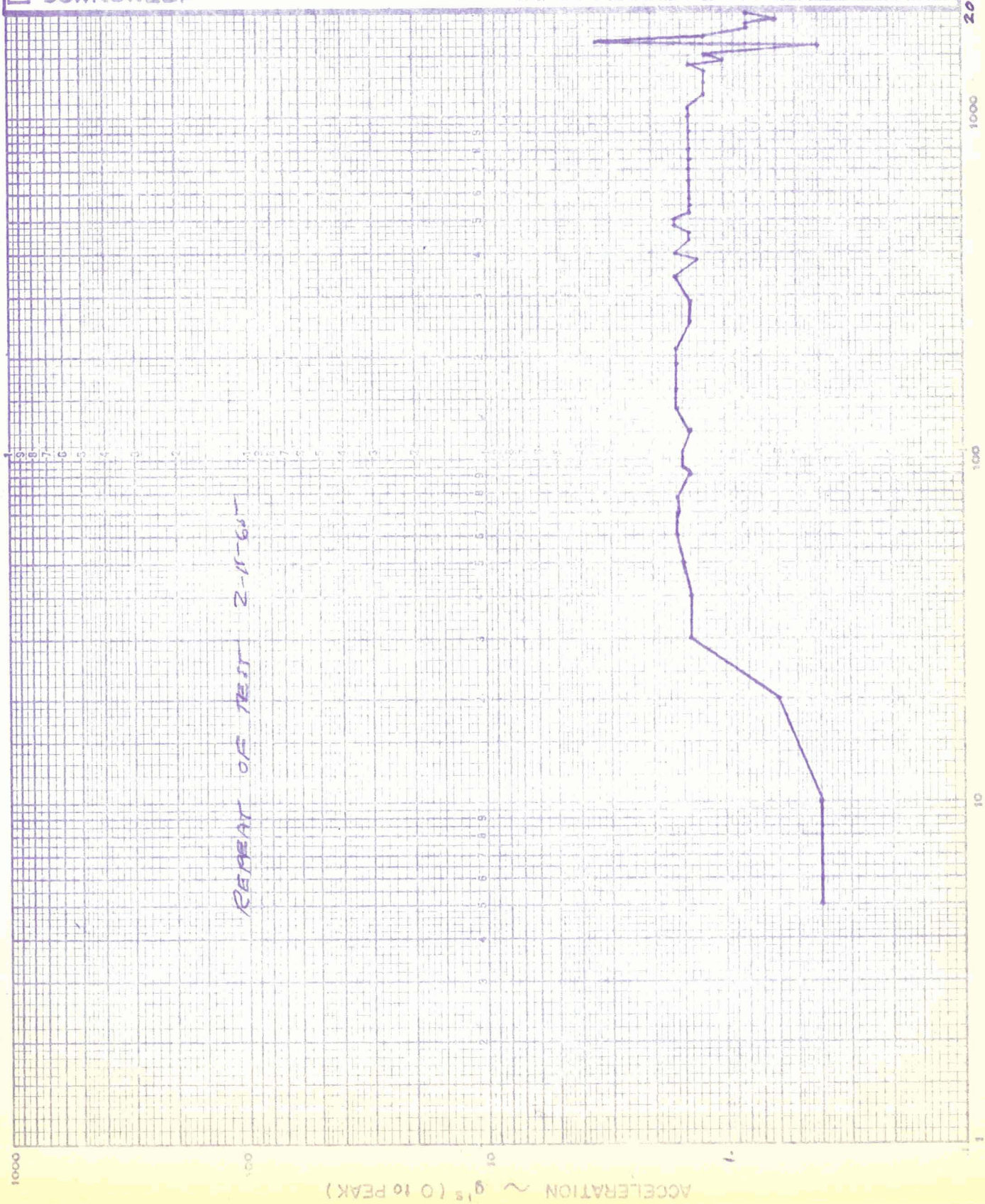
TEST DATE 2-12-65

AXIS OF EXCITATION X

PICK UP NUMBER 2KA35 2242C

PICK UP RESPONSE IN Z AXIS

INPUT ACCEL. PER PAGE



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SIV-B GENERAL PURPOSE RELAYS AP10-12
SINUSOIDAL FREQUENCY SWEEP -85°F

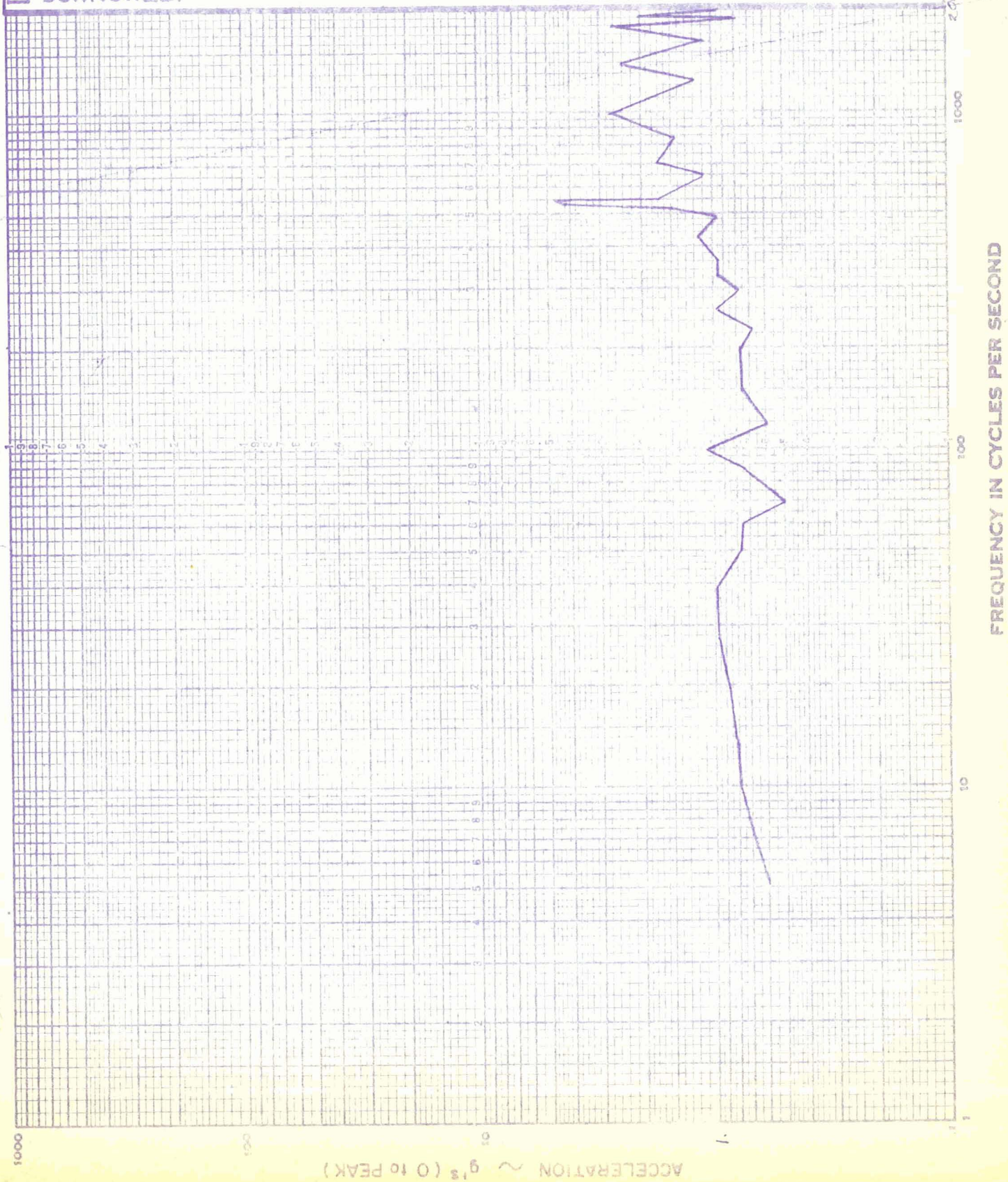
CONFIGURATION: RELAYS # 31, 33, 34

NOTE: SEE PAGE 81, 82, 83 FOR PICK UP LOCATION.

☒ UPSWEEP ———— CROSSTALK

☐ DOWNSWEEP - - - - - -

TEST CONDITIONS:
TEST DATE 2-13-65
AXIS OF EXCITATION Y
PICK UP NUMBER 1-FA49 2242C
PICK UP RESPONSE IN X AXIS
INPUT ACCEL. PER PAGE



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SIV GENERAL PURPOSE RELAYS AP10-12
SINUSOIDAL FREQUENCY SWEEP -85°F

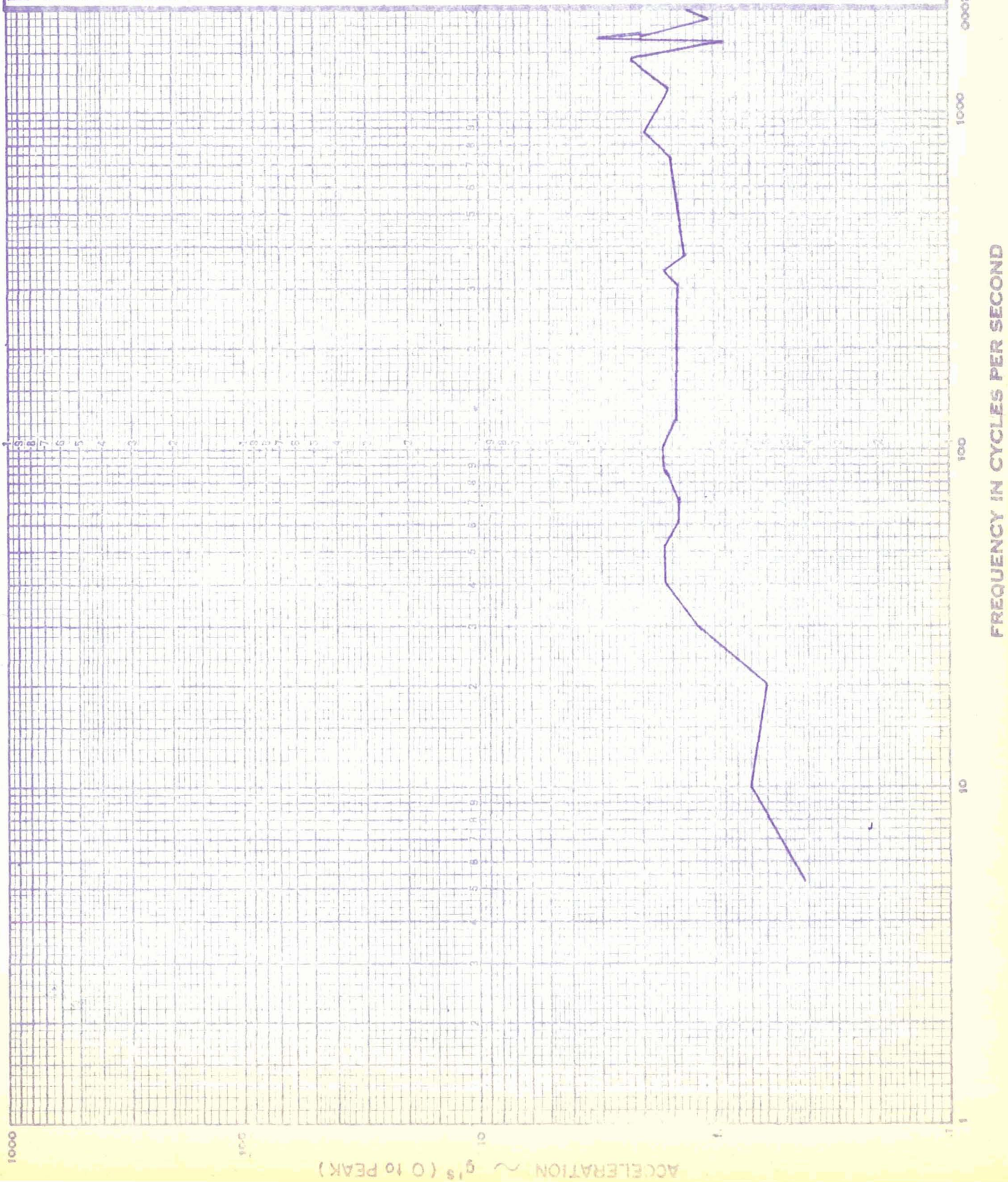
CONFIGURATION: RELAYS #31, 33, 34

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☒ UPSWEEP ——— CROSSTALK

☐ DOWNSWEEP - - - - - -

TEST CONDITIONS:
TEST DATE 2-13-65
AXIS OF EXCITATION Y
PICK UP NUMBER 2-KA352242C
PICK UP RESPONSE IN Z AXIS
INPUT ACCEL PER PAGE



30

SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP AMBIENT

CONFIGURATION: RELAY #43

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☒ UPSWEEP ——— CROSS TALK

☐ DOWNSWEEP - - - - - -

TEST CONDITIONS:

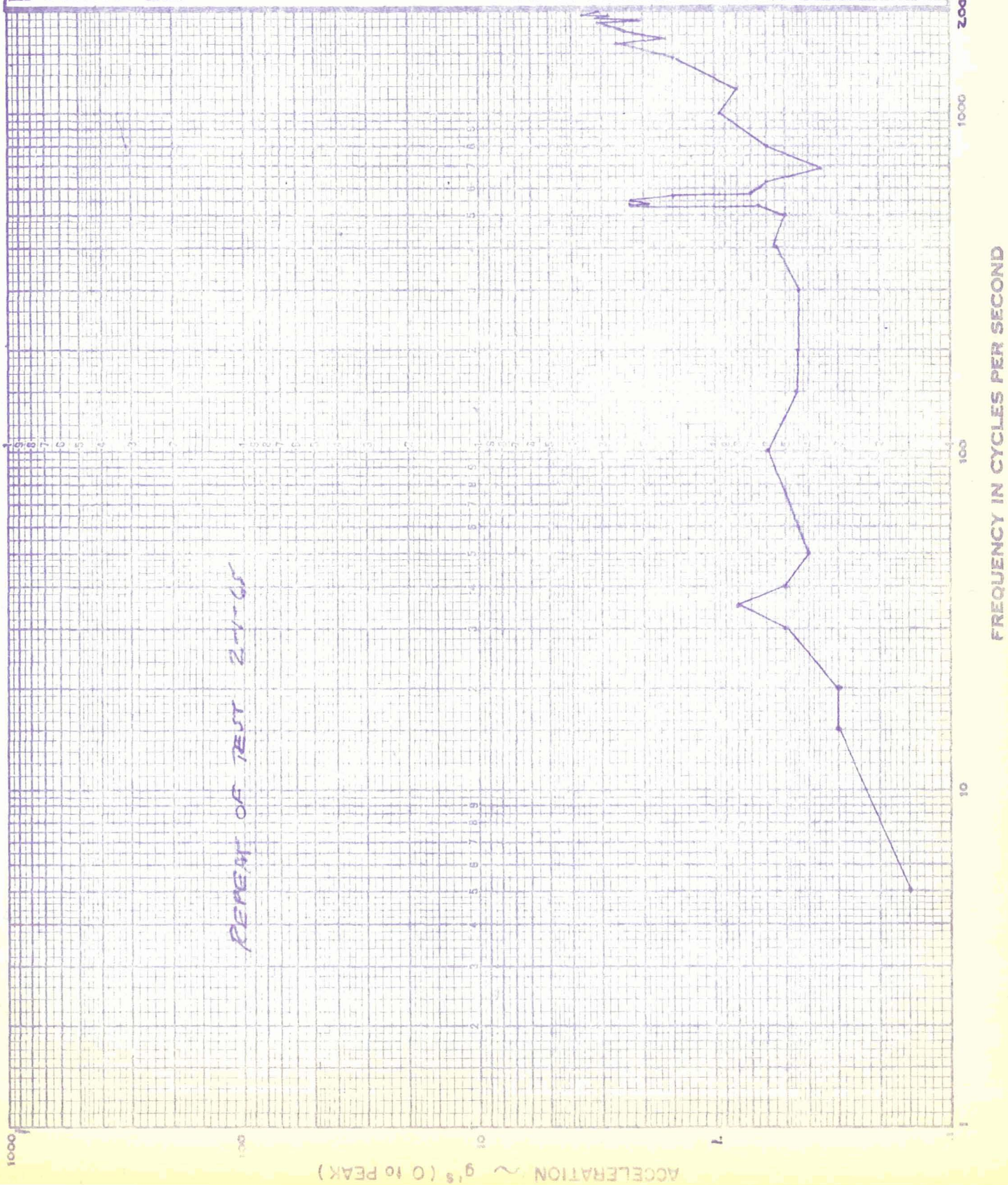
TEST DATE 2-13-65

AXIS OF EXCITATION Y

PICK UP NUMBER 1 FA49 22420

PICK UP RESPONSE IN X AXIS

INPUT ACCEL. PER PAGE



31

SIV-B GENERAL PURPOSE RELAYS AP10-12

SINUSOIDAL FREQUENCY SWEEP AMBIENT

CONFIGURATION: RELAY #43

NOTE: SEE PAGE B1, B2, B3 FOR PICK UP LOCATION.

☒ UPSWEEP ——— CROSSTALK

☐ DOWNSWEEP - - - - -

TEST CONDITIONS:

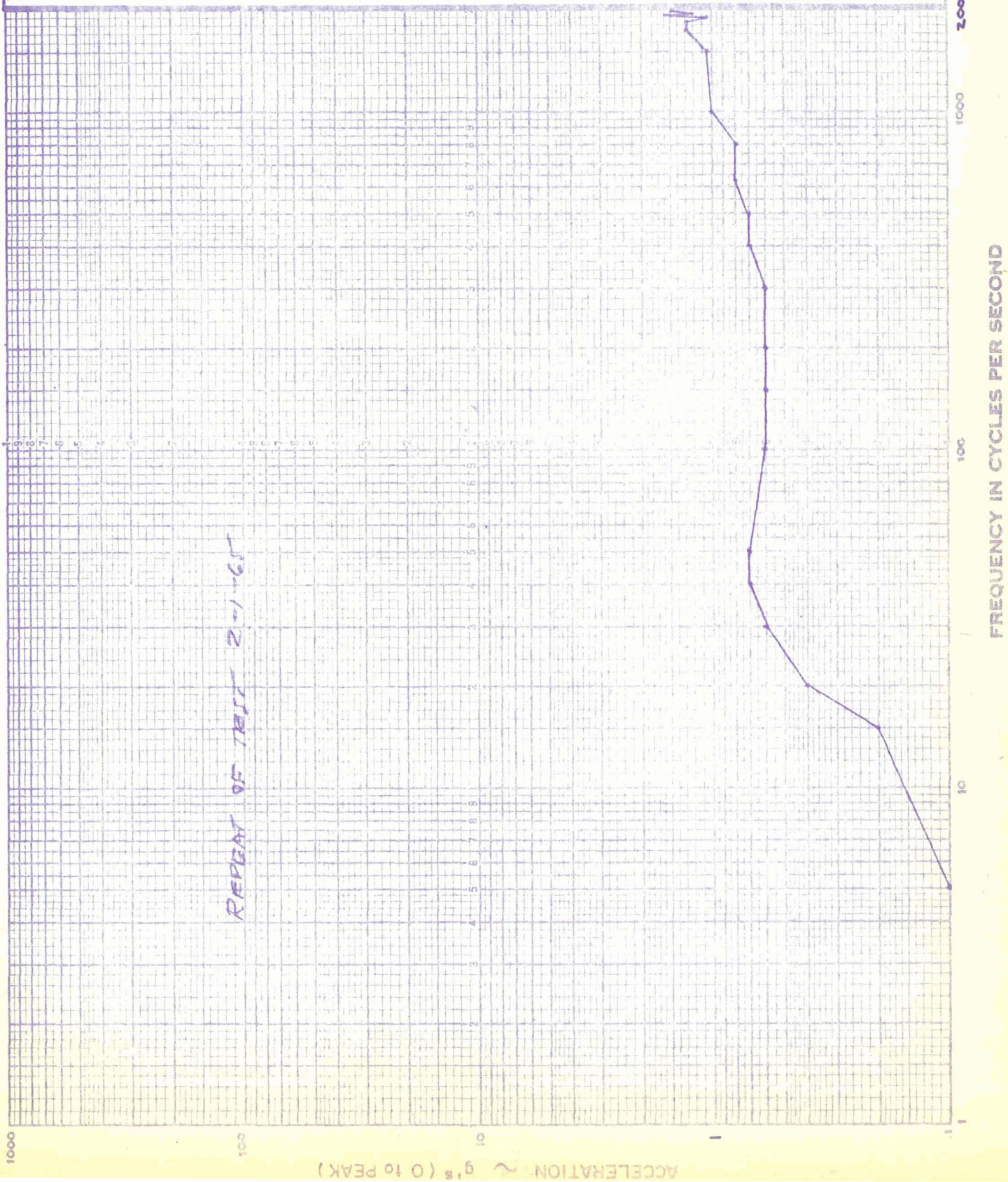
TEST DATE 2-13-65

AXIS OF EXCITATION Y

PICK UP NUMBER 2 KA35 2242C

PICK UP RESPONSE IN Z AXIS

INPUT ACCEL. PER PAGE



GENERAL PURPOSE RELAYS

P/N 1A67747-1

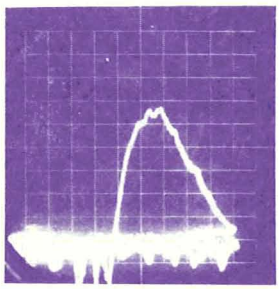
SHOCK PULSE

2/27 and 3/1/65

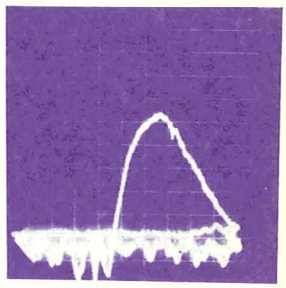
10G/Division 2 MSEC/Division

5769-6304
27808
IT 06947
(AP10-12)

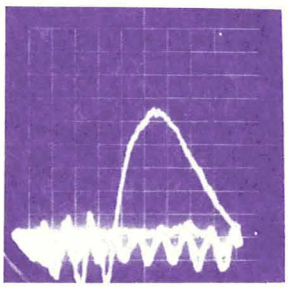
X_1 AXIS
S/N 1,2,5,6,7



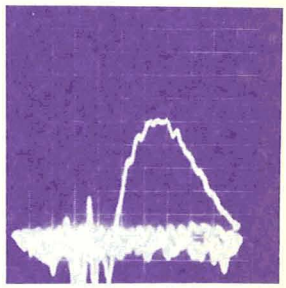
X_2 AXIS
S/N 1,2,5,6,7



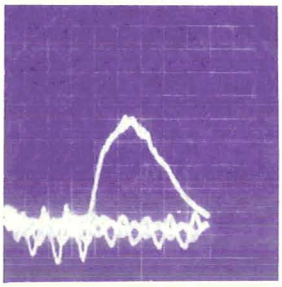
Y_1 AXIS
S/N 1,2,5,6,7

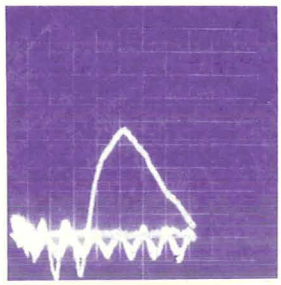


Y_2 AXIS
S/N 1,2,5,6,7

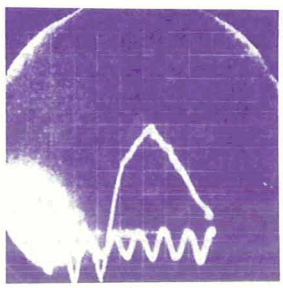


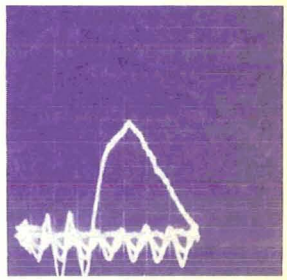
Z_1 AXIS
S/N 1,2,5,6 S/N 7,9





Z_2 AXIS
S/N 1,2,5,6,7 S/N 9



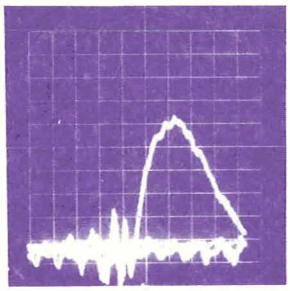


33

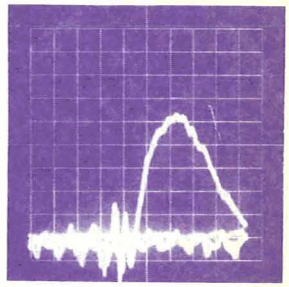
GENERAL PURPOSE RELAYS
P/N 1A67747-1
SHOCK PULSE
3/1 and 3/2/65
10G/Division 2 MSEC/Division

5769-6304
27808
IT 06947
(AP 10-12)

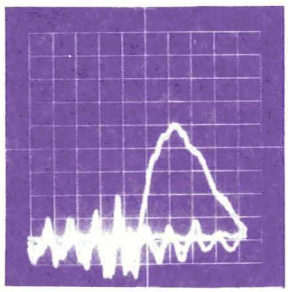
X_1 AXIS
S/N 9,10,11,12,13



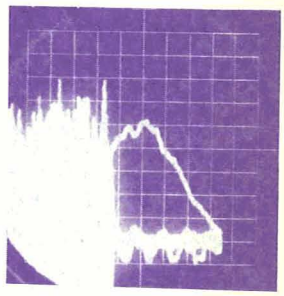
X_2 AXIS
S/N 9,10,11,12,13



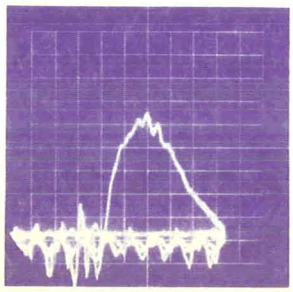
Y_1 AXIS
S/N 9,10,11,12,13



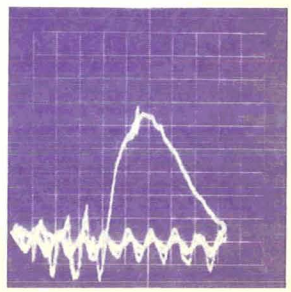
Y_2 AXIS
S/N 9,10,11,12,13

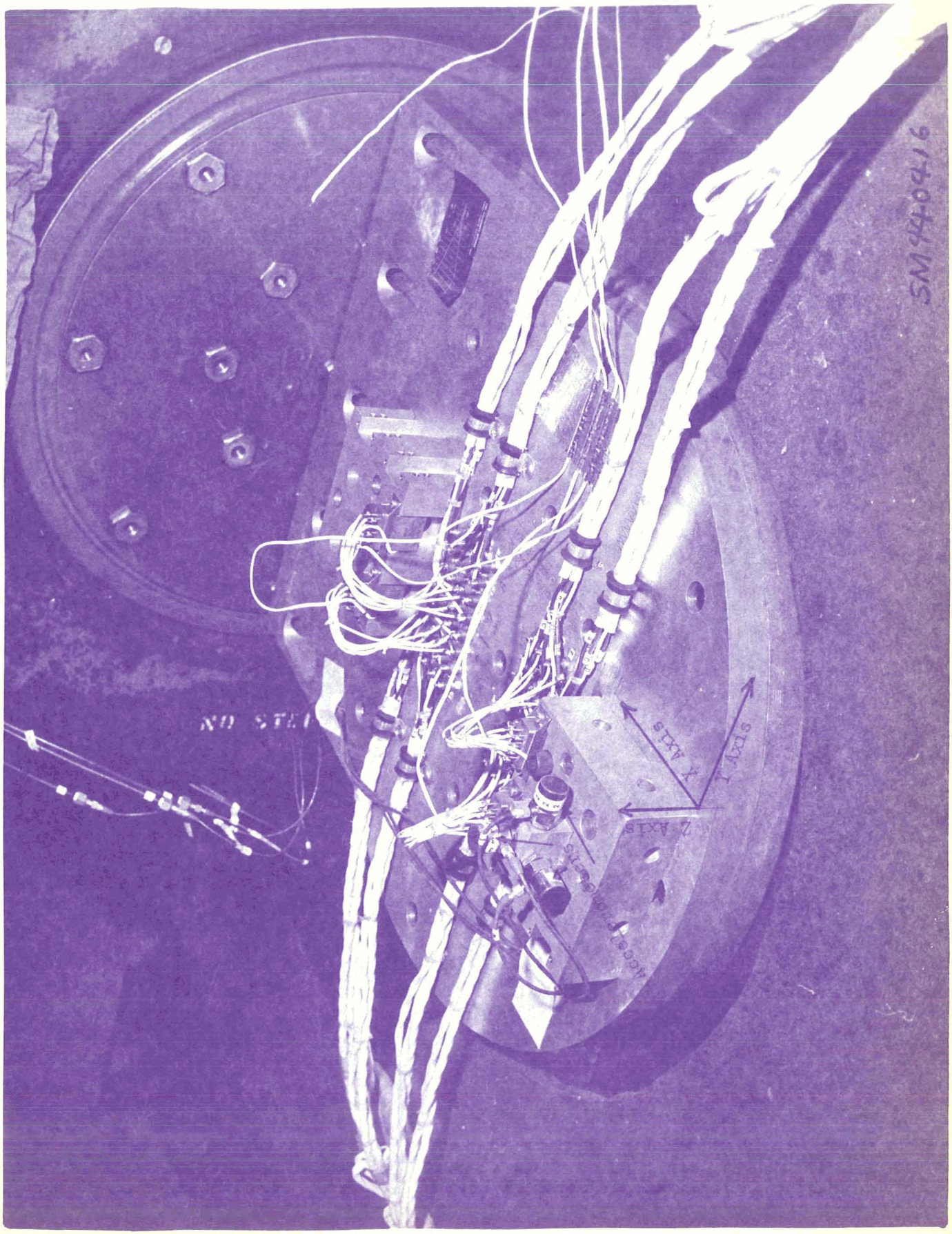


Z_1 AXIS
S/N 10,11,12,13



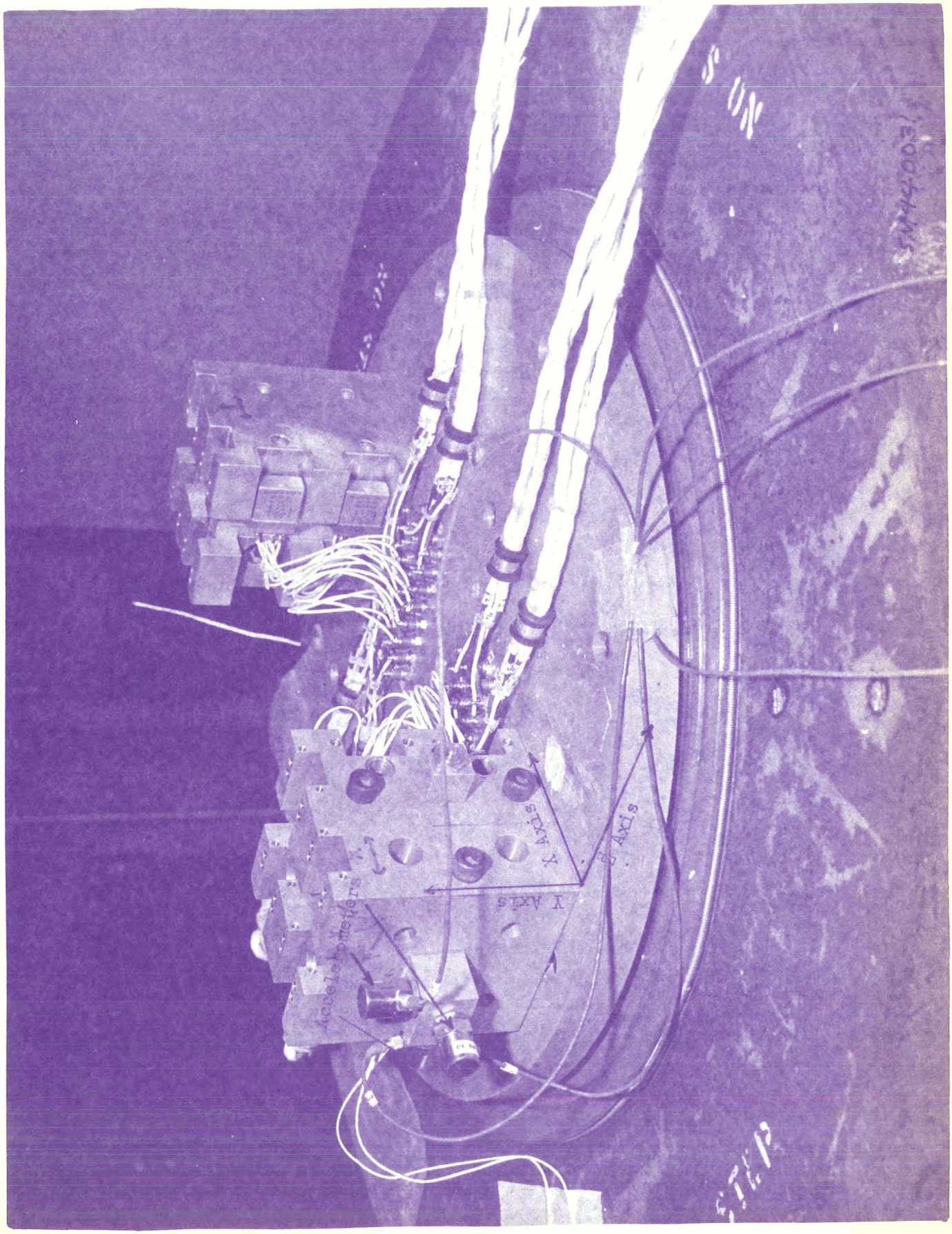
Z_2 AXIS
S/N 10,11,12,13



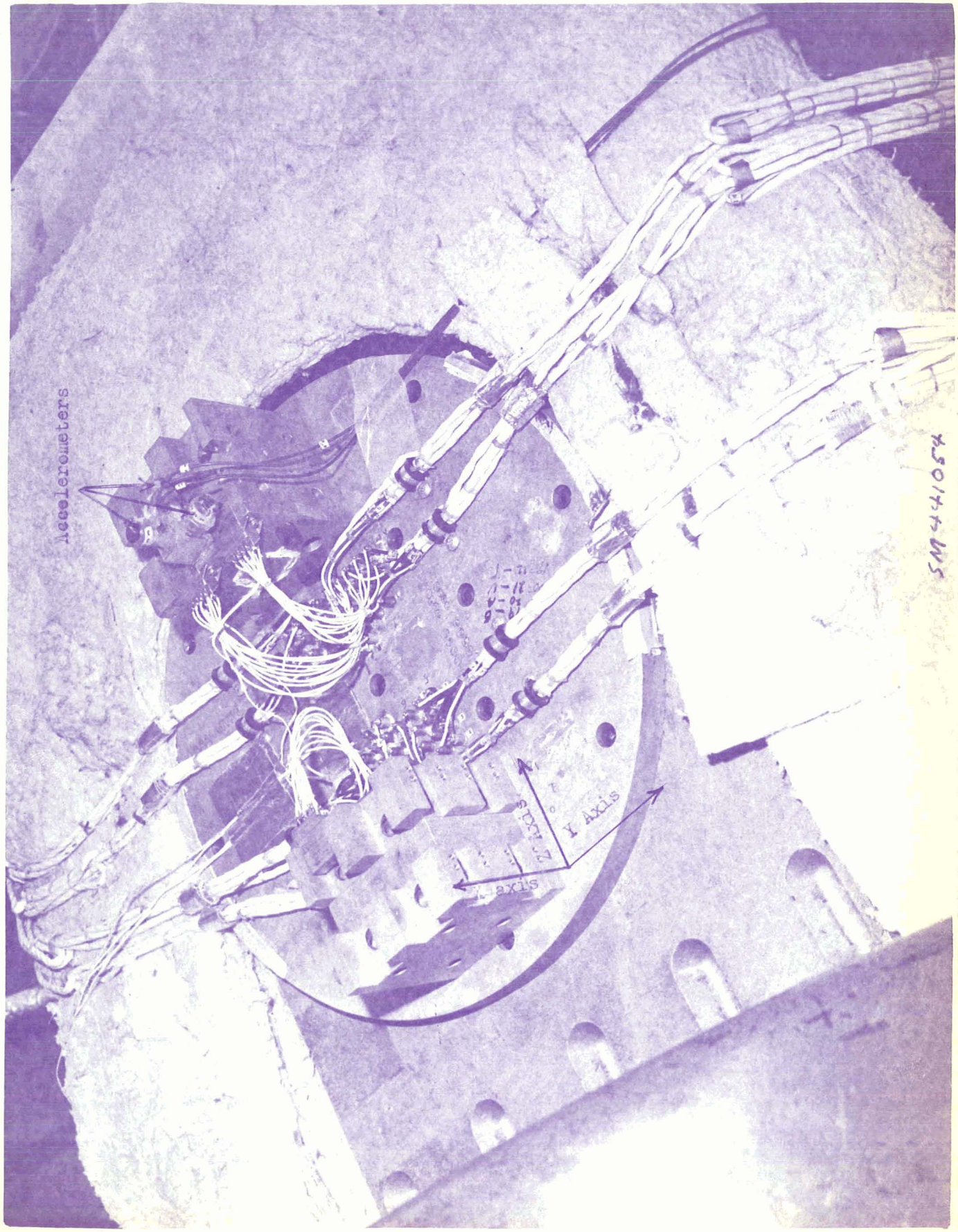


ACCELEROMETER LOCATIONS - AXES DESIGNATION (X AXIS)

35



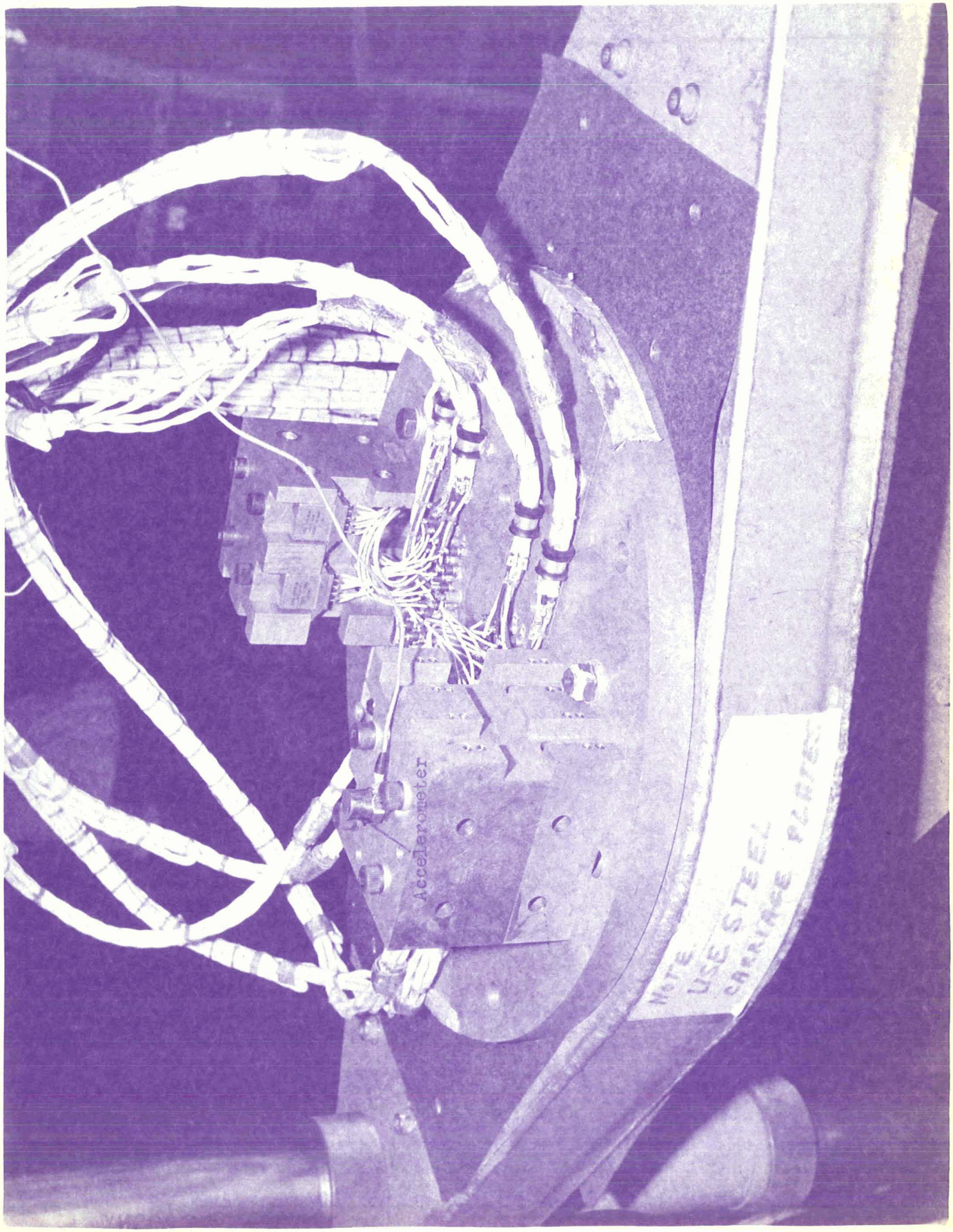
ACCELEROMETER LOCATIONS - AXES DESIGNATION (Y AXIS)



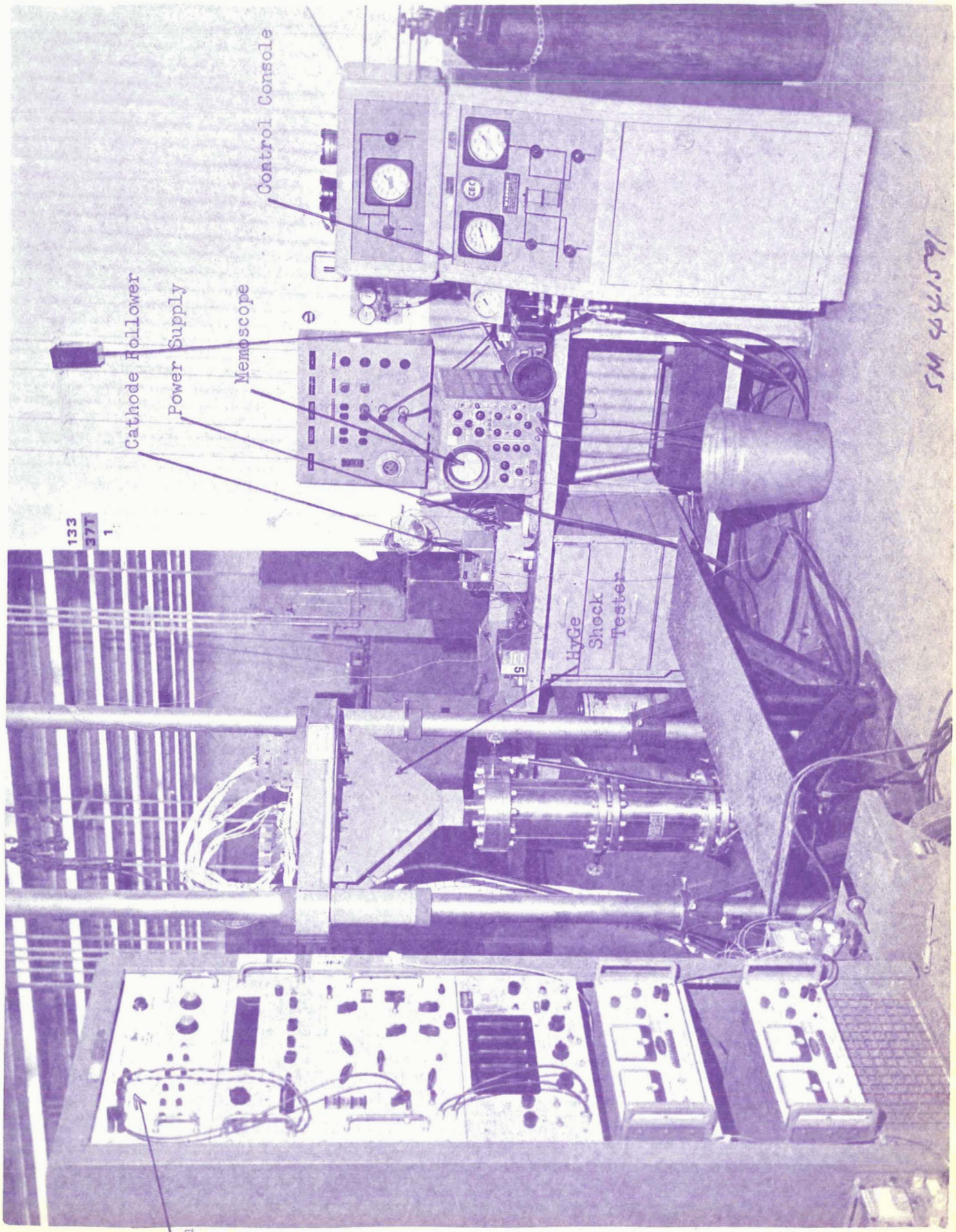
ACCELEROMETER LOCATIONS - AXES DESIGNATION (Z AXIS)

SM44054

37



ACCELEROMETER LOCATION FOR SHOCK TESTS - Z_1 AXIS



HYGE SHOCK TESTER AND ASSOCIATED EQUIPMENT